

MOTOR AGE

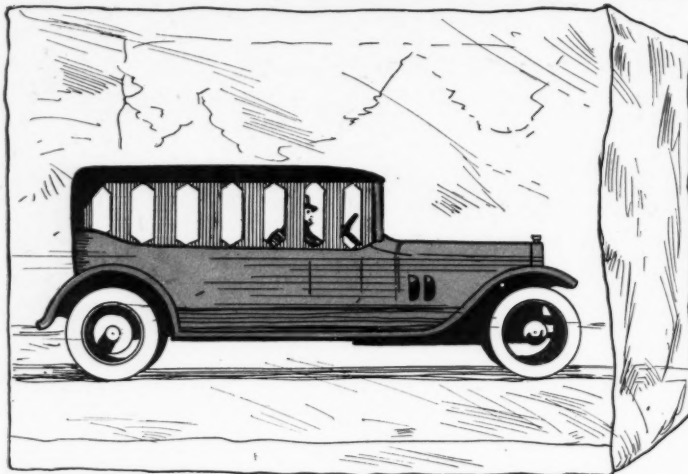
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No. 26

CHICAGO, DECEMBER 27, 1917

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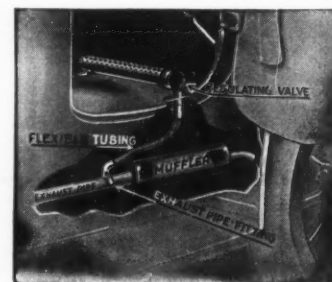
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Keep the Driver Warm

MOTOR AGE

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NEXT WEEK

The issue of MOTOR AGE for next week is the annual New York show number. In this each car is illustrated and described in brief. In addition the year's offering in engineering development is considered and the tendency of the motor car industry as a whole is revealed. This year many of the makers have delayed announcement of their 1918 models until the show number, and in this issue you will be able to read for the first time of the changes made in some of the most prominent makes. You cannot keep up with the progress of the car without a ready reference in which are contained the specifications, descriptions and illustrations of all the latest models. With the New York show issue you obtain this reference, which serves as a guide for the rest of the year.

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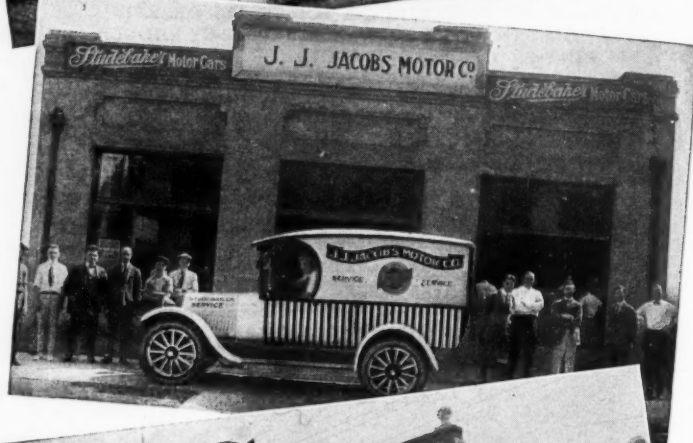
EVEN now when building activity in all lines is considerably below normal, Studebaker dealers in all parts of the country continue to erect new and larger buildings.

The Studebaker dealer can logically follow such a course. His success with Studebaker cars and his knowledge of the gigantic resources which safeguard his future, inspire his complete confidence.

The illustrations shown on this page are typical examples of buildings recently erected by Studebaker dealers.

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Address all correspondence to South Bend.



MOTOR AGE



A Motor Year Revamped by War

By Darwin S. Hatch
Editor Motor Age

Illustrations by Quin Hall

AMERICA'S entrance into the world war has been the dominant factor in motordom of 1917. Its effect has been threefold:

1—Our Government has come into the market as the preferred customer for the products of the manufacturers, for specialized vehicles, for the materials which normally make up the vehicles, for the man power and for the transportation facilities.

2—It has come into the market for the savings of the public, and to an appreciable extent has borrowed the money which in other years has gone into the purchase of motor cars.

3—It has called much of the best brains and engineering experience of this and other industries into Government service for the design and production of the specialized implements of war.

These three direct effects of our entrance into the world war have been of paramount importance in the motor history of the year. They have resulted in decreased production of motor cars for home consumption, in a somewhat decreased demand for cars from the buying public, particularly in certain fields, and

naturally enough, the phenomenally rapid growth of the industry which heretofore has been for private consumption is being diverted to military channels.

With our Government and those of our allies in the market for materials and supplies and man power both in the war equipment factories and in the field, there grew the idea in uninformed Governmental centers that the material and labor which is necessary for the production of motor cars might be utilized better in the production of purely war supplies.

This idea gave rise to reports of a contemplated curtailment of the industry and injected an element of uncertainty into the industry that still remains to be cleared away in spite of recent statements of Federal authorities that no classification of motor cars among the non-essentials is contemplated.

So far as the actual lessening in the demand for motor cars for private or semi-private use is concerned, this has not been nearly as great as the pessimists in the spring would have had us believe it would be. Much of the lessening in sales during the summer seems to have been due to alarm on the part of dealers and a consequent letting down of their sales efforts.

The fact cannot be denied, however, that there has been a distinct falling off in sales due to Liberty loans and other war conditions.

The biggest development of the industry and one which will have the most important bearing on the inter-relation of America's engineering in the future has been the co-ordination of effort on the parts of engineers and factories in the design and production of the standard airplane engine and the standard war trucks. It is doubtful if we can at this time realize what it will mean to the automotive industry as a whole to have the engineers and the factories putting their best brains and best efforts together for the design and production in great quantity and at greater speed of airplanes and trucks for the Government.

That a standard aviation engine which would perform in a manner comparative with that of those which have been developed in Europe through three years of war could be designed and be running in regular production within the short space since America entered the war hardly was conceivable before the accomplished fact. Now we have these engines beginning to be turned out in quantities from two or

three factories, and others soon will have them in production.

The showing made in the design and tooling up of the Liberty aviation engine was cast in the shade by the wonderful success of this principle of co-ordination of engineering talent and factory equipment which was shown in getting out the class B war truck for the Quartermaster's Department. At the instance of the chief of the motor vehicle department of the Q. M. department, all the best motor truck engineers in the country met together and decided upon standard specifications for a 3-ton war truck.

These specifications were embodied in factory blue prints, and instructions and a dozen plants, some building engine parts, some building axles, some frames, etc., commenced work on their production. Within twenty days after receipt of the blue prints, patterns had been made, castings molded and machined and two complete trucks were on their way to Washington from the two original assembling plants, one at Lima, Ohio, and the other at Rochester, N. Y. How well these designs were planned and how well they were followed out may be gained from the fact that the only change of importance which

mile, 45, 80 m.p.h.; 2-mile, 1:30.4, 79.6 m.p.h.; 3-mile, 2:17.6, 78.6 m.p.h.; 4-mile, 3:05.6, 77.6 m.p.h.; 5-mile, 3:53.6, 76.9 m.p.h.; 10-mile, 7:56.2, 75.6 m.p.h.; 15-mile, 12:00.8, 75 m.p.h.; 20-mile, 15:52.2, 75.6 m.p.h.; 25-mile, 19:57.6, 75.2 m.p.h.; and 50-mile, 40:47.6, 73.6 m.p.h.

Fred Gung in HAL broke record between Pittsburgh and Chicago, making it in 15 hr. 13 min., or 503 miles at 33.4 m.p.h.

Joe Dawson, driving a Chalmers, set new record of 100 miles an hour at Sheepshead Bay, driving 83 miles 2889 ft. in an hour and 100 miles in 1:11:53.5, or 83.46 m.p.h.

Ray McNamara, driving a Maxwell, in two weeks during August set three of most important road records in Canada, as follows: Windsor to Toronto, 6 hr. 50 min.; Toronto to Montreal, 11 hr.; Montreal to Quebec, 4 hr. 1 min.; the Montreal-Quebec record shattered all previous motor car records in Canada and beat the express train 59 min.

Sept. 3 at Chicago de Palma broke world's record formerly held by Aitken with a new time of 11:02.4, or 108.7 m.p.h., for the 20-mile, 13 sec. less than former record, and drove the 50-mile in 28:09.38, 106.5 m.p.h., 3 min. 48 sec. faster than Resta's time at Chicago June, 1916.

Milton, driving a Duesenberg, set new records for the 25 and 100 miles at Providence Sept. 15, driving 25 miles in 19:46.28 and 100 miles in 1:24:42.23, new track records.

Louis Chevrolet, driving a Frontenac at Sheepshead Bay Sept. 22, beat his own record held for cars in the 231-300 cu. in. class by driving 100 miles in 54:20.98, or 110.4 m.p.h.

Hearne at Uniontown Oct. 29 set a new track record for 168 miles of 1:49:02.45, or 92.84 m.p.h.

Joe Dawson, driving a Chalmers, established a record between San Antonio and Dallas of 6:55:40, 305 miles at 43 m.p.h., against a previous mark of 9 hr.

McNamara, driving a Maxwell, in October, made the distance from Detroit to Indianapolis, Chicago and back to Detroit in 23 hr. 9 min., with an actual running time of 20 hr. 47 min. Actual running average for the 802 miles was 38.63 m.p.h.

De Palma, driving a Packard at Sheepshead Bay Nov. 2, set a new mark for cars in the 231-300 cu. in. non-competitive class for the 10 miles of 5:17.4, or 113.7 m.p.h., against the former Brooklands record in 1914 of 112.6 m.p.h. and the world's free-for-all record set by Rader in a Packard at 120.5 m.p.h.

Nov. 10, driving at Sheepshead Bay a Packard, de Palma set a new hour record of 109 miles against 107 at Brooklands, and Nov. 16 a 6-hr. record of 616 miles against the Brooklands mark of 566 miles 589 yds.

Joe Dawson, driving a Chalmers, set a new mark for the 130 miles between Oklahoma City and Tulsa of 3 hr. 38½ min. against 5 hr.

New Records for Old

A. H. Patterson, driving a Hudson, broke 100-mile track record at Santa Rosa, Cal., in May, finishing in 95 min. 25 sec.

Joe Dawson in Chalmers stripped stock chassis turned mile at Pablo Beach, Jacksonville, Fla., in 38.1 sec., or 94.48 m.p.h.

A. H. Patterson, driving a Hudson, set new track record at Tacoma July 5, driving 150 miles at 90.4 m.p.h.

In a series of three races with Barney Oldfield at Detroit, Ralph de Palma set new record for 25-mile July 4 at 21 min. 2½ sec. Former record held by Bob Burman and made at Bakersfield, Cal., 21:37:60.

Barney Oldfield made a new track record for the 10-mile at Providence July 21, with a time of 8:14 1/5 against 9:02 1/5 made by de Palma in 1915 in the 100-mile sweepstakes won by Rickenbacker.

All circular track records from ¼-mile to 10 miles were broken July 27-28 by W. Rader in a Packard with a 265-hp. aviation engine at Sheepshead Bay speedway. Fastest time was made in the ¼-mile, 6.9 sec., or 130.4 m.p.h. Other records were: ½-mile, 13.95 sec., 129 m.p.h.; 1-mile, 28.76 sec., 125.1 m.p.h.; 10-mile, 4:50.88, 123.7 m.p.h. Brookland's records for these distances were broken, making these world's records.

Clarence Shockley, driving a Stutz, set

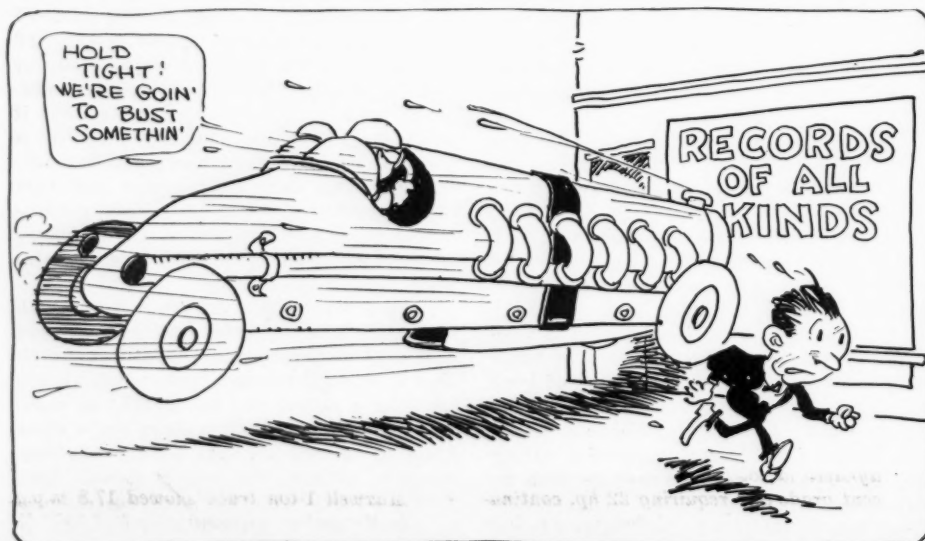
112-mile record July 22 on dirt road from Denver to Cheyenne in 2.09 hr. Best previous record was 2.17 made



three years before by Harold Brinker in a Cadillac.

Joe Dawson, driving a Chalmers at Sheepshead Bay Aug. 4, set new world's record for 24 hr., driving 1898 miles against 1819 made in a Hudson in 1916. Old hour mark of 77 miles was bettered 6 miles and a new 100-mile mark of 70:45.98 set up. Joe Gardham drove 5 hr. of the 24.

Barney Oldfield established new world's dirt track records at St. Louis Aug. 11 for 10 and 15 miles, beating the Burman records made at Bakersfield in 1915, with new times of 7:58.8 for the 10-mile, or 76.6 m.p.h. against 8:06, and 12:04 for the 15-mile, or 74.5 m.p.h., against 19 sec. Also broke all records for 1 to 5, 10, 15, 20, 25 and 50 miles on dirt track with records as follows: 1-



Maxwell non-motor stop car was brought to a halt Jan. 26 after running 1560 hr. and covering 23,600 miles. Gasoline average was 19½ m.p.g. and oil 450 m.p.g. at a speed just under 15 m.p.h.

In an unofficial test of the Wilmo manifold on a Ford and an Oakland at Chicago the Ford with standard equipment scored 14.4 m.p.g.; with Wilmo, 23 m.p.g.; and the Oakland showed a mileage increase of 42 per cent with the Wilmo as against without.

Test of a Saxon by the J. V. Baldwin Co., Los Angeles, Cal., on the Ascot speedway as to running on high showed 24 hr. at 2.9 m.p.h. with 68 miles covered.

Test of the Duntley hydro-pneumatic gas generator on a Little Giant 2-ton truck from Chicago to Des Moines, Iowa, 393 miles, used 42 gal. half-gasoline half-kerosene.

An A.A.A. test of a Ford at Chicago with new carbureter made by the Automobile Mfg. Co. showed 29.8 m.p.g. and acceleration from 5 to 25 m.p.h. in 13 sec., with six traffic stops: With stock carbureter the score was 15.4 m.p.g., one traffic stop, 5 to 25 m.p.h. in 14.6 sec.

In a 100-mile low-gear run made by a Franklin at Des Moines to test cooling ability 13½ m.p.h. was made over icy roads with no sign of overheating.

As part of a 24-hr. non-motor stop test a Chalmers seven-passenger grid-ironed Chicago loop in an hour at slightly more than 25 m.p.h. with low and intermediate gears removed. Run was made on 42 gal. of gasoline at 14 m.p.g. and 6 qt. of oil, 2 gal. 3 pt. water and two drivers in 8-hr. shifts. A.A.A.

An A.A.A. test of the G. P. system on a Ford car showed 25.5 m.p.g. against 23 m.p.h. with gasoline and acceleration 10 to 25 m.p.h. in 15.6 sec., idling down to 10 m.p.h. with the same adjustment and 4 m.p.h. with richer adjustment.

In a 24-hr. test a Chalmers five-passenger made 71.7 miles as the minimum number of miles in that time on high gear. Four stops were made. Average was 2.9875 m.p.h. and 10:06 m.p.g. Acceleration from 5 to 25 miles was made in 12 sec. The third Chalmers high-gear 24 hr. test included 188 stops and covered 346.2 miles at 14.4 m.p.h. with a gasoline mileage of 11.9 m.p.g. A sedan was used. In a low-gear 24-hr. test in Minneapolis and St. Paul 257.6

was made after rigorous road tests was in the size of the wheels.

Following the getting under way of the 3-tonner, a similar method was pursued in the design and production of the class A truck, 1½-tonner, and class AA, a still lighter truck, which probably will be produced in enormous quantities. The production of these lighter standard vehicles promises to overshadow the speed with which the heavy ones were turned out.

Of the 30,000 class B trucks which are to be produced, 10,000 already have been contracted for. The complete list of contracts awarded, which approximates \$50,000,000, follows:

500 Each	
Bethlehem Motors Corp.	Allentown, Pa.
Brockway Motor Truck Co.	Cortland, N. Y.
Diamond T Motor Car Co.	Chicago
Garford Motor Truck Co.	Lima, Ohio
General Motors Truck Co.	Pontiac, Mich.
Indiana Truck Co.	Marion, Ind.
Kelly-Springfield Motor Truck Co.	
	Springfield, Ohio
Kissel Motor Car Co.	Hartford, Wis.
Packard Motor Car Co.	Detroit
Republic Motor Truck Co.	Alma, Mich.
Service Motor Truck Co.	Wabash, Ind.
Sterling Motor Truck Co.	Milwaukee, Wis.
United States Motor Truck Co.	Cincinnati, Ohio
Vellie Motors Corp.	Moline, Ill.
1000 Each	
Gramm-Bernstein Co.	Lima, Ohio
Pierce-Arrow Motor Car Co.	Buffalo
Selden Motor Vehicle Co.	Rochester, N. Y.

1917 Test Development

of gasoline. Highest was made by James Lephart of Greenville, Ohio, with 44.6 m.p.g., with George Napier, Macon, Ga., second with 44.

Briscoe made record of 39.2 m.p.g. of gasoline around Dallas with stock equipment.

A.A.A. test of Chalmers acceleration June 9, Dawson driving, five-passenger, showed from standstill to 33 m.p.h. in 10.2 sec.

Dodge Brothers test of flexibility of their four-cylinder resulted in 465 miles on high with 19.5 m.p.g.

In Los Angeles dealers' economy run 370 miles to Camp Curry, Yosemite Valley, a Franklin brougham driven by Ralph Hamlin, with three passengers, won on 17 gal.

and nights and was made at 23.17 m.p.h. and 22.49 m.p.g.

Kissel ran 2023 miles down Pacific Coast in August to test possibility of mobilizing. Run was made in 92 hr. 4 min. on 140½ gal. of gasoline at 14½



m.p.g. and won two cups. Hal Stone driver. Defense League sponsor.

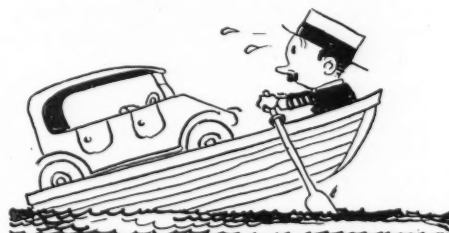
In October the Hyatt Roller, the Buick sent out by Hyatt on a trip throughout the country with the original bearings, reached the last lap of its 12,000-mile jaunt after rolling up score of more than 250,000 since it was made.

First official economy and acceleration test in which equipment and method of testing recommended by S. A. E. is made to determine value of Motor-Pep, combined fuel energizer and carbon remover, on a Maxwell Oct. 17-21 by A.A.A. Using Motor-Pep 1/5 oz. to a gallon of gasoline at 10 m.p.h. gain in economy was 60.5 per cent but above and below gasoline alone showed greater economy. Above and up to 40 m.p.h., Moto-Pep showed economy of 10½ and 20 per cent, with the greatest gain at 30 m.p.h.

In a motor truck test run between Fort McPherson and Fort Oglethorpe Oct. 30, held under military direction, eighteen soldiers and their equipment were transported at a saving of \$2.89 a man and 3 hr. time.

U. S. Tire tested pneumatic truck tires on 1½-ton Packard with 2¾-ton load from Detroit to San Antonio and back, south on fabric and back on one fabric and three cord tires. Right front tire covered 4288 miles without break, and no puncture was made coming back. Mileage was 98 miles day, 3½ m.p.g. returning and 33.42 m.p.g. of oil.

In an economy run through Detroit a Maxwell 1-ton truck showed 17.8 m.p.g. in November, carrying a load of 1970 lb.



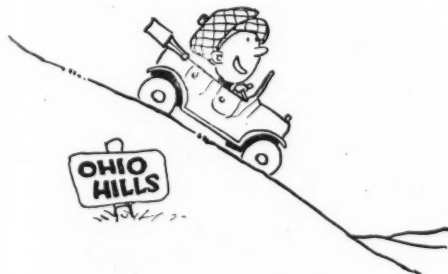
Franklin dealers held economy tests and reached grand average of 40.3 miles on 1 gal. for 179 entries. Cowles Tolman, New Haven, Conn., made mark of 82.8 miles on a gallon July 3.

A record of 37,482 miles is set by Fred



Westmans, Brooklyn, N. Y., winner of fourth annual tire mileage contest of Ajax Rubber Co.

In non-official non-stop run Oldsmobile set mark of 26,149.3 miles. Test was made at Boston agency with car on jacks and rear wheels belted to 17-kw. dynamo, a load equivalent to 10½ per cent grade and requiring 22 hp. continuously. Test consumed forty-seven days



miles were covered at 10.73 m.p.h. and 35 gal. gasoline and 3 pt. oil were used by the five-passenger.

Maxwell held economy test May 23 in which \$5,000 in prizes and cups were awarded for high records made on 1 gal.

Arguing the Patent Cases

Suit is brought against Defender Autolock Co., charging infringement of patents in key-operating electric and Autolock switches owned by Warren R. Cox, manager motor car department of Blackburn Specialty Co.

Bradenburg & Co. sue Buda Co., alleging breach of contract and asking damages of \$250,000 and an accounting according to terms of sales contract.

Gottfried Piel, G. Piel Co., owner of Long hand horn patent, files suit against Emanuel Aufiero, charging the Aufiero interferes with Long patent, which, it is claimed, has the right of priority.

Settlement is made of dispute in England over basic patent of detachable wire wheel; Napier patents are declared invalid but patents covering method of attachment or locking devices are not affected.

Stewart-Warner sues Sparks-Withington and Heinze Electric Co., claiming violation of patents covering vacuum gravity system of gasoline feed to carbureter. Suits are directed against the Sparton and Heco system, presented for first time at New York show.

Winton Co. wins decision in litigation with Lindsay Auto Parts Co. over axle patent, the decision reversing decision of lower court which held the patent valid and infringed by Winton. Patent covers axle of floating type.

Preliminary injunction is granted C. F. Discher of the Gemco Mfg. Co. against Shadbolt & Boyd Iron Co., prohibiting sale of bumper made by Emil Grossman Mfg. Co. pending trial of suit for infringement, and Grossman appeals decision.

FEBRUARY

Perlman Rim Corp. sues Firestone Tire & Rubber Co., alleging infringement of demountable rim patent No. 1,052,270.

MARCH

F.A. Sieberling and Goodyear vs. Firestone suit concerning tire-building machine is held on appeal. Hundreds of thousands in dollars involved as royalties.

Kardo front axle patent is upheld by U. S. Circuit Court of Appeals, which declares it infringed and upholds validity of claim of patent No. 753,820, reversing decision of lower court which held Baker patent void.

Stewart-Warner sues Auto Parts Co., alleging infringement of Webb Jay patents under which Stewart vacuum system is made, with object to obtain action on Thermos vacuum system.

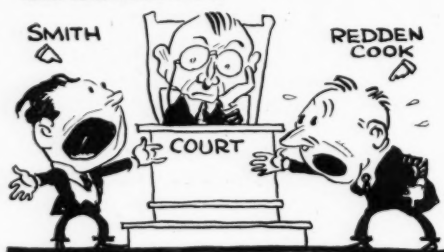
Standard Varnish Works and Wenborne-Karpen Dryer Co. reach agreement in differences as to patent matters concerning apparatus and processes for drying varnish.

APRIL

Commercial Acetylene Co., owner of patent under which Prest-O-Lite Co. is licensed to store acetylene by the acetone process, sues Prest-O-Lite, claiming refusal to pay royalty since the Searchlight decision in which the patent was held to have expired through the expira-

tion of a British patent covering the process. Searchlight decision was reversed. Injunction and damages were asked.

Fiat Co. brings suit charging infringement of patent covering construction of cored intake manifold and asks injunction and damages against Saxon Motor Car Corp. and Saxon Motor Car Co. of New York, Moon Motor Car Co. of New York, Hupp Motor Car Corp. and Hupmobile Co. of New York and Charles E. Reiss & Co., Paige-Detroit Co. of New York, Inc., Burford & Co., Ltd., and Garland Automobile Co.



MAY

Redden Motor Truck Co. and Albert E. Cook, owner of Cook truck-forming patents, ask injunction against Smith Motor Truck Corp. to discontinue making Form-a-trucks. Infringement is alleged as another step in suit brought by Cook and Redden in 1916. Smith filed suit in October, 1916, to restrain Cook and Charles W. Hills, attorney for Cook and Redden, from representing a valid contract under which the Smith company agrees to pay royalties.

JUNE

Suit of Perlman Rim Corp. against Firestone, charging infringement of Perlman demountable rim patent, is dismissed on motion of Perlman counsel. First suit brought under Perlman patent following decision affirming 1915 decision which upheld validity of patent and declared it infringed by Standard Welding.

U. S. Circuit Court of Appeals upholds decision that Bendix product does not infringe Bijur patent, held to be the conclusion of patent infringement litigation between Bijur Motor Lighting Co., Eclipse Machine Co. and Vincent-Bendix on Bendix electric starter drive. Case hinged on claim of Bendix to contract with plaintiff to use patent and in turn allow Eclipse Co. to work under the terms of the contract. Bijur denied contract but lost.

Reo wins patent decisions in case of William Barber vs. Reo in which it was sought to recover \$1,500,000 for alleged infringement of old patent involving valve mechanism.

Atlas Specialty Mfg. Co. wins suit brought by Hobbs Patent Co. for alleged infringement of patent covering radiator and hood. Hobbs patent held void for want of patentable novelty.

JULY

Patent infringement action pertaining to method of controlling output of electric generator brought by H. Ward Leon-

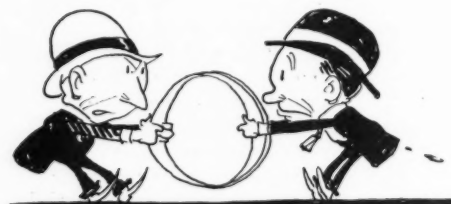
ard against Maxwell Motor Sales Co. sustained and injunction granted suspended to give defendant opportunity to appeal.

SEPTEMBER

Louis deF. Munger brings suit against Firestone for back royalties amounting to \$1,500,000, claiming damages through having been unable to dispose of patents on account of Firestone rim, the first suit as result of court decision against Perlman Rim in June. Patent covers tapered rim fitting into tapered felloe.

Long-standing litigation between Universal Rim Co. and Standard Parts Co. terminated by adjustment through which Standard Parts is made free to make rims of every type embodying features covered by the so-called Baker group of rim patents.

U. S. District Court declines to modify previous decree enjoining Maxwell from further infringement of patent covered by patent granted to Ward Leonard and covering controller. Previous order sus-



pended injunction and accounting on condition Maxwell file bond and monthly statement of cars and apparatus embodying inventions of patents shipped or delivered by it subsequent to decree and until mandate of Court of Appeals and to pay \$5 for each apparatus shipped during period of suspension.

OCTOBER

New testimony from Perlman Rim states Louis deF. Munger is not owner of rim patent on which suit is based, and court vacates judgment in favor of Munger. Perlman claims owner is H. F. Herbermann, attorney, who bought it from Philadelphia junk dealer who has owned it since 1903, when he took over the assets of the Munger Automobile Co., which failed.

NOVEMBER

Firestone wins point in patent suit with Goodyear when case is reopened and sent back for rehearing. Order is due to discovery by Firestone of Belgian tire-building machine claimed to antedate Goodyear-State.

Department of Justice brings suit against Lovell-McConnell Mfg. Co., maker of Klaxon horn, to get injunctions under the Clayton anti-trust act to prevent enforcement by defendant of constant stipulations that jobbers handling its horns handle no others and sell only at prices fixed by Lovell-McConnell.

DECEMBER

Munger wins suit to determine ownership of rim patent and is reaffirmed in right to collect royalties.

These three types are not the only war trucks which the industry is furnishing in great quantities to our Government. Certain branches of the Army are ordering thousands of trucks which drive on all four wheels. Such service as ordnance work for hauling heavy guns, etc., are taking many hundreds of Four-Wheel-Drive and Nash Quads. Many of the factories turning out lighter vehicles are supplying cars for ambulance and other light work. Tractor industry also is busy with war work both for our Government and for the Allies, and it is no secret that armored cars and something closely resembling the famous tanks of the European war front are being turned out. The necessity of greater production from our farms has made the tractor a most important factor.

Not only in the production of land vehicles but also for those of the air are motor car factories being used. The year 1917 has seen the turning over of complete plants or portions of them to the production of airplane engines and other aviation material. Many of our factories are employed in part in turning out other munitions of war not so closely allied to the motor car. Of these little can be said, but it can be stated that the motor car industry when this war is over will have been found to have broadened out to a greater extent than most of us imagine.

When the United States went to war, it called for the best business and organization brains of the country. In doing so it drew heavily upon the motor car industry. To put a finger upon the big men of the industry, we must go to Washington. The Council of National Defense itself, as well as many of its sub-committees, is manned in part by the motor industry. We find such men as Howard Coffin, Christian Girl, H. L. Horning and scores of others who are giving their time and efforts to getting supplies for our boys at the front.

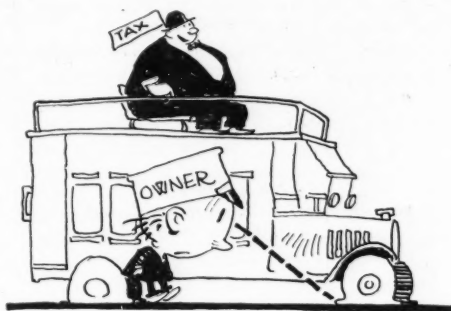
Driving Overland

It was through the far-sightedness of these men and others like them that there has come into being a movement which will become of increasing importance, first, in solving our transportation problems and, second, in developing some real system of road building and road maintenance. This is in the arrangements for driving the war trucks overland from their assembling points to their ports of shipment, and driving them loaded. The class B truck alone could relieve an enormous tonnage from the railroads if each one of the 30,000 were to carry its 3-ton load from some interior assembling point to port.

This system is just in its beginning. The country has not awakened to the fact of its existence or its importance. It was necessary for the Secretary of War to bring Government pressure to bear upon the governor of one state before he would see that the state appropriations for road work was made along the connecting link which would make truck passage possible. The war trucks now are going overland, and will be going in increasing numbers.

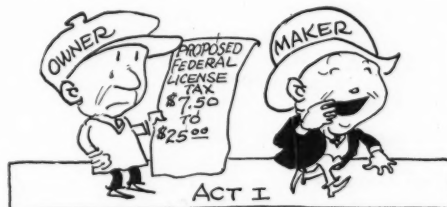
If the roads are to be kept up, an efficient patrol system will have to be maintained. Such a patrol system is necessary on all roads which have heavy traffic. It may be anticipated that it will not be dropped when the immediate war necessity

New Laws



New York imposes graduating tax on motor trucks and buses. Increase totals in some cases up to 1400 per cent.

Missouri doubles license fees, graduating them according to horsepower from \$5 to \$12. License fees for trucks are rated by weight unloaded, \$5 for 2000 lb. to \$30 for 10,000 lb.



House passes bill carrying Federal license tax on owners, ranging from \$7.50 to \$25 with reduction for use of a year or more and Senate finance committee agrees. In June, however, Senate drafts new section in revenue bill, placing war tax at 1 per cent of selling price of cars. Later the tax passes in the form of a 3 per cent tax on cars, with the makers responsible.

Texas new registration law went into effect, cars to be numbered by the state

is over. The transportation crisis during the last few months also brought out the immediate necessity of the greater utilization of commercial vehicles for short hauls to relieve the congestion of the already overcrowded railroads for the transportation of war necessities over the greater distances. This is a movement which will not end with the war.

The motor industry as a whole has answered the call of war most wholeheartedly. This applies to the men in the factories and garages and the drivers as well as to the heads of the plants who are working at Washington. Thousands of skilled drivers and mechanics have enlisted in the motor equipment division of the ordnance corps and in the aviation corps. The roll of officers bristles with the names of men in the industry.

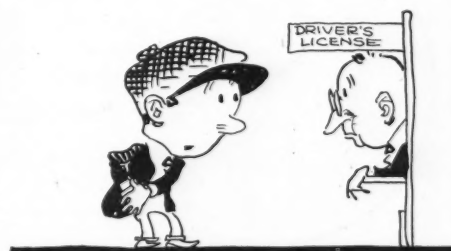
The racing season of 1917 was not a specially brilliant one from the standpoint of spectacles. There were fewer races this year than in previous years. Some of the stars of the speedway were missing, some taken by death and some by war. One favorite of the speedway, Eddie Rickenbacher, is now driving a plane in France, and many of the lesser lights of racing are in the aviation camps either on this side of the water or on the other.

Competition from new European cars and drivers was out of the question on account of war conditions. The veteran of the speedways in America, the Indianapolis oval, did not hold a race this year, and will not during the period of the war, and

instead of county. Between \$5,000,000 and \$6,000,000 anticipated as revenue.

New York passes law requiring all operators of motor vehicles to register and obtain certificates from secretary of state to permit them to drive, owners to receive license without examination at \$1.

Illinois passes state headlight law whose chief provisions are that no glaring headlights can be used under any circumstances within 200 yds. of an ap-



proaching vehicle but must be dimmed or extinguished.

Canada forbids use or carrying of spotlight on or in cars, and motorists crossing the border are warned to remove them.

Maine passes new light law limiting candlepower to 24 and allowing use of various devices but prohibiting lens of colored glass.

Los Angeles law pertaining to use of headlights and spotlights goes into effect, and no ray from headlights and spotlights is permitted to rise more than 42 in. at 75 ft.

The Industry's Year in Brief

JANUARY

Comparison of the two national shows disclosed 323 exhibitors of cars and accessories at New York, 272 gasoline and thirteen electric cars, and 258 exhibitors of cars and accessories at Chicago. New York has 227 exhibitors of accessories; Chicago, 162. Unofficial estimates placed the attendance at New York between 300,000 and 500,000, while Chicago's attendance fell somewhat below that of the previous year, which was 260,000. Of the fifteen distinct makes shown at the Astor salon only three were foreign. Eleven exhibited at Chicago's second salon.

Spranger Rim & Wheel Co. reincorporates as Spranger Wire Wheel Corp., with \$300,000 capital.

Springfield Motors Co. organizes with capital of \$5,000,000 to make Frank Trego's V-type aviation engines.

Arthur Holmes, formerly vice-president and chief engineer of Franklin Mfg. Co., and C. H. Rockwell, former sales manager of Franklin, with Western capitalists, form Holmes Automobile Co. with a capital of \$2,500,000 to make an air-cooled engine car at Canton, Ohio.

Seven subsidiaries of General Motors reincorporate: Buick Motor Co., General Motors Truck Co., Jackson-Church-Wilcox, Northway Motor & Mfg. Co., Oakland Motor Car Co., Olds Motor Works and Weston-Mott, each with a capital of \$10,000, and General Motors took over entire manufacturing operations.

Continental Motors Co. reincorporates as Continental Motors Corp. with a capital of \$18,500,000.

C. M. Hall Lamp Co. buys Badger Brass Mfg. Co.

Dearborn Motor Truck Co. reorganizes

as the Dearborn Truck Co. with a capital of \$500,000.

Elgin Tractor Co. takes over Waite Tractor Co. with a capital of \$300,000.

C. A. Hagberg Rubber Co. reincorporates as the Hagberg Automobile Supply Co. with a capital of \$150,000.

FEBRUARY

Pullman Motor Car Corp. organizes to market output of Pullman Motor Car Co. with a capital of \$250,000.

Standard Parts Co. buys Bock Bearing Co.

Commonwealth Finance Corp. organizes with capital of \$10,000,000 to finance purchase of motor vehicles on the time-payment plan.

Amazon Tire & Rubber Co. reorganizes as Amazon Rubber Co. with a capital of \$500,000.

Dyneto Electric Co. reorganizes as the Dyneto Electric Corp. with a capital of \$500,000.

MARCH

Palmer Tire & Rubber Co. organizes with capital of \$500,000.

Monarch Machine Works buys Christensen Eng. Co.

Disbrow Motors Corp. organizes with capital of \$300,000.

Hall-Scott Motor Car Co. gets request from War Department to furnish all available aviation engines for next six months, and Fageol Motors Co. agrees to permit its allotment to be used for this.

States Motor Car Co. refinances for \$6,000,000 to make a four to sell for less than \$900 and a six at less than \$1,200.

Wire Wheel Corp. of America buys Houk Mfg. Co. and George W. Houk Co., sales organization, clarifying wire wheel patent situation with acquisition of

American rights of Rudge-Whitworth, Dunlap, Cowles, House and Houk.

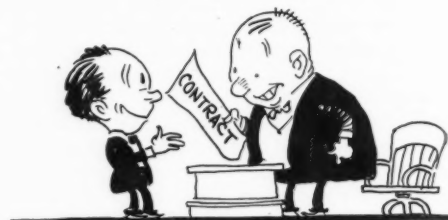
Wheeler-Schebler Carburetor Co. reincorporates in Indiana and Michigan with a capital of \$1,000,000 in each with no change in policy.

Halladay Motor Car Co. incorporates with capital of \$1,000,000.

Standard Parts Co. buys Western Spring & Axle Co.

Trego Motors Co. organizes with capital of \$1,500,000 to build engines, airplanes and flying apparatus.

Spacke Machine Co. reorganizes as the Spacke Machine & Tool Co. with a capital of \$255,000.



APRIL

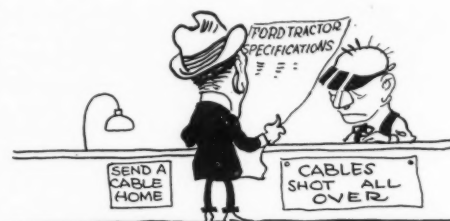
Willys-Overland accepts contract from Curtiss Aeroplane to make 4500 airplane engines for United States.

Packard Motor Co. starts delivery on Government trucks.

Motor Transport Reserve Committee is appointed by Council of National Defense to mobilize cars and trucks for emergency needs throughout the country. Personnel is Roderick Stephens, Coker F. Clarkson and A. G. Batchelder.

Ford waives patent rights on tractor and cables specifications to Great Britain at request of English government.

Rubber committee is appointed by Council of National Defense—H. Stuart



Hotchkiss, U. S. Rubber; Arthur H. Marks, Goodrich; F. C. Hood, Hood Rubber.

Experimental models of Ford truck appear in Detroit, and announcement is made that they will sell at close to \$500.

E. A. Laboratories, Inc., buys business, patents, etc., of Automobile Supply Mfg. Co., maker of Newton horn.

MAY

Doble-Detroit Steam Motors Co. organizes with capital of \$10,000,000 as the only company with right to use Doble in title of products, though others may be licensed under Doble patents to use Doble powerplant.

SKF Administrative Co. forms to administer affairs of SKF Ball Bearing

Co. and Hess-Bright Mfg. Co., which fuse.

Supreme Motors Corp. is organized with capital of \$1,000,000 to make twin-six, six and four and absorbs Davis-Mitchell Eng. Co. of Cleveland, Ohio.

Dowse Rubber Co. is organized with capital of \$2,500,000 by B. C. Dowse, formerly president and general manager of Federal Rubber.

Steamotor Truck Co. organizes with capital of \$3,000,000 to make truck using Doble powerplant.

Titan Motors Co. organizes with capital of \$350,000 to make engines.

Consolidated Motors Corp. acquires Thomas Auto Truck Co. and Armored Motor Car Co.

Remy Brothers Tractor Co. incorporated with capital of \$500,000.

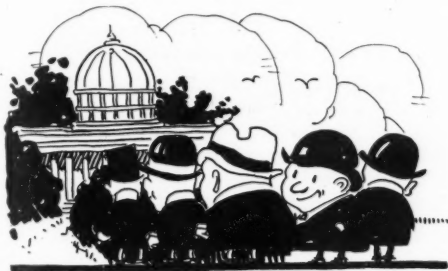
JUNE

Universal Valveless Four-Cycle Motor Co. changes to Muskegon Engine Co. and announces intention to bring out line of 1- and 2-ton trucks.

Motor Accessories Corp. organizes with capital of \$2,000,000 to handle nationally advertised accessories for cars and trucks with two branches in every state and to make dry cells, carbureters, etc.

Fifty-nine passenger car makers bid on two- and five-passenger cars and eighty-one truck makers bid on 1½- and 3-ton trucks at request of Government.

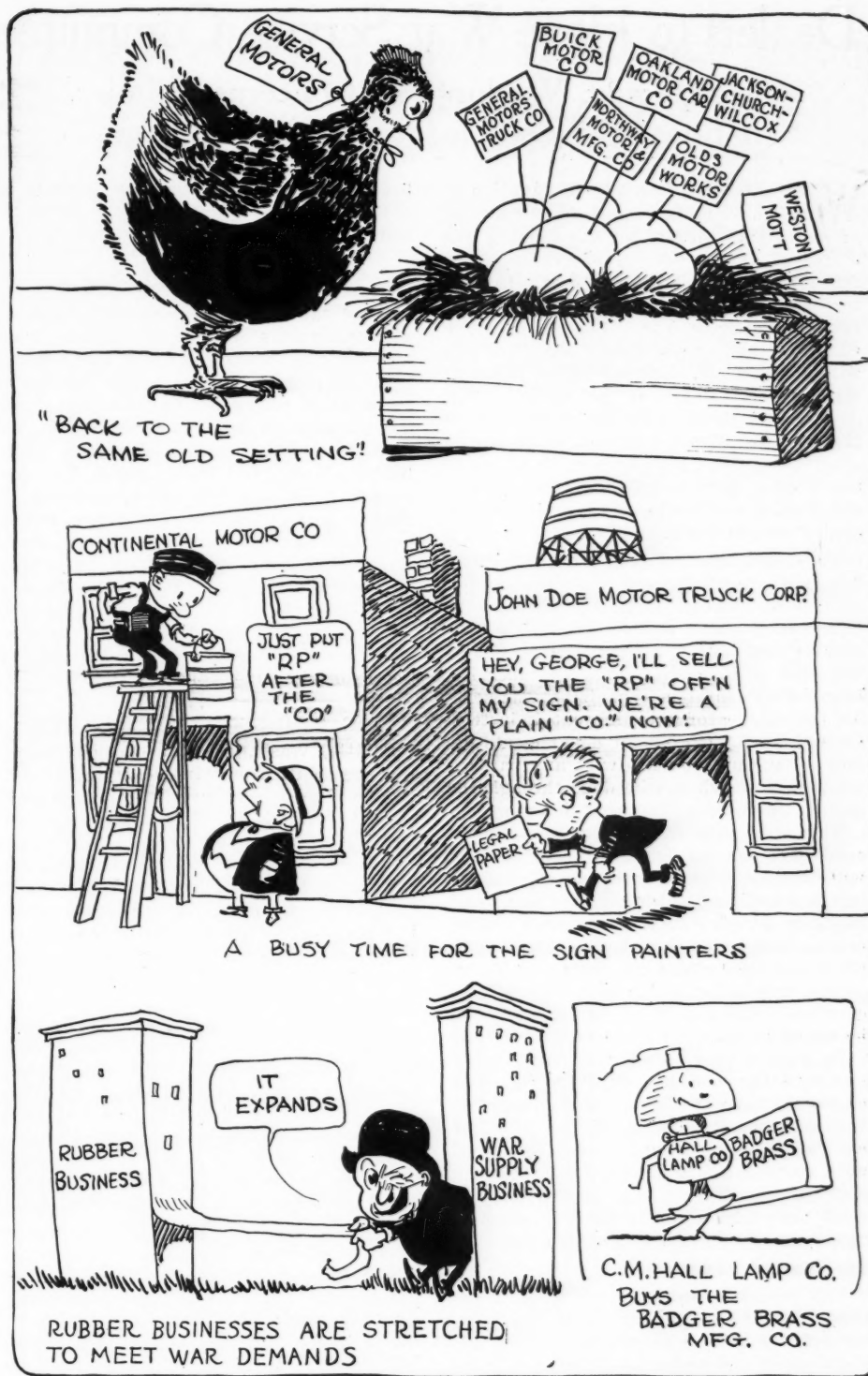
Henry M. Leland and son, W. C. Leland, president and founder and vice-president and general manager respectively of Cadillac Motor Car Co., resign



to make airplanes for United States, organizing Lincoln Motor Co.

W. G. Wall, vice-president and chief engineer of National Motor Vehicle Co., is placed in charge of design and pro-

(Continued on page 24)



others curtailed their program. Finally, the quietus to organized racing was given when the American Automobile Association announced at the end of the racing season that no more events would be sanctioned until the war is over.

From the standpoint of speed records, the last season was more fortunate. In competition several records were broken, while time trials, particularly with the aviation type of engine, reaped a harvest of world records, with de Palma gathering the most of these.

The year 1917 saw the motorist handed a heavier burden in the way of taxation than he has had to pay before. The chief item in this was the 3 per cent Federal tax

placed on the manufacture of each new car. Naturally enough, this was passed on by the manufacturer to the dealer and from him to the owner. The owners as a whole, however, have paid the tax without murmur, just as they paid the added tax on their cigars. In many states also the state license fees were increased, due usually to increase in proposed road improvement to take advantage of the Federal aid which was offered last year. In other states they voted to increase their taxes with the understanding that the increase was to be placed in road improvements.

Road work as a whole was carried forward to an extent greater than that of previous years and, which is just as impor-

tant, along well directed lines. In most instances, the extensive road improvements were made along connecting lines, which looked to final consummation in unbroken improved roads across the country.

Death claimed some of the important men in motordom during the last year. Among these were J. M. Studebaker, Sr., founder of the Studebaker Corp.; George W. Houk, pioneer of the wire wheel business; F. E. Enger, president of Enger Motor Car Co.; Cornelius Van Dyke, president Rutherford Rubber Co.; Alexander A. Strom, president of the U. S. Ball Bearing Co.; E. G. Westlake, pioneer motor journalist; and Amidee Bollee, who built a steamer in 1873.

Dealers to Have War Service Committee

Meeting at Washington Concerns Elimination of Waste in Merchandising Cars

WASHINGTON, Dec. 22—Elimination of all waste in the retail merchandising of motor cars throughout the country was discussed at the Council of National Defense Wednesday, when seven or eight motor car dealers representing dealer organizations in New York, Boston, Chicago, Cleveland and one or two other cities met with A. W. Shaw, chairman of the Commercial Economy Board of the council. The plan contemplated is similar to that which the Economy Board has been operating in other trades and industries with which it has been co-operating for months, namely, elimination of waste of material, labor, capital and so forth.

To obtain this economy more efficiently Mr. Shaw has suggested the organization of the Automobile Dealers' War Service Committee, which will be one of the war service committees of the United States Chamber of Commerce. The chamber has been instrumental in organizing war service committees of the different industries so that when Government departments desire to take up problems with any particular industry such can be done through the committee representing that industry.

The first duty of such a war service committee of the dealers of the country will be to consider the problems of economy in merchandising motor cars and parts and to draft a series of such economy recommendations and take them up with Mr. Shaw and the Commercial Economy Board. Just now it is impossible to say what these economies will consist of, but dealers will be asked to study present conditions carefully with a view to more correctly interpreting future conditions. There would be no thought of curtailment in the manufacture of motor cars or parts, as the Commercial Economy Board is not concerned with curtailment of production or curtailment of any other phases of the industry other than that which pertains to economy in merchandising cars and accessories.

To Consider Economy

The plan is more one that would have every dealer and garageman in the country operate more economically. More efficient use of raw materials entering into the operation of a business, such as gasoline and oil, and raw stock needed in repairs, would be observed. Until the report of the dealers' war service committee is submitted and the Commercial Economy board has opportunity to discuss the report, there is no telling how thorough the field of economy can be made and how much accomplished without curtailing of the industry in any respect, as such a thought is entirely foreign to the spirit of the movement.

The new War Service Committee will serve as a connecting link between the 30,000 dealers and garagemen and the Government departments or committees. It is hoped that each dealer and garageman will analyze his own business with this thought of further economy without restriction of

business in mind, so that his methods of economy can be brought before the Commercial Economy Board.

TO EXAMINE MECHANICS

Washington, Dec. 24—Special telegram—Examinations will be made this week and early in January by the War Department for officers in the motor mechanics regiment of the Signal Corps at the Packard branches in New York, in Detroit, Indianapolis, Ind., Toledo, Cleveland, Ohio, Boston, Mass., and Philadelphia, Pa. Applicants must be motor car mechanics qualified to do any work on motor cars and to organize repair crews and direct them. Each must have three letters from past employers, stating the kind of work now being done and the compensation received. An applicant must be at least twenty-eight years old. Those passing will receive lieutenants' commissions.

BIG DOINGS IN NORTHWEST

Seattle, Wash., Dec. 22—Demonstrating the possibilities of winter driving in the Pacific Northwest, two motor cars will cross the width of Washington, Dec. 30, meeting near Seattle, where a good roads jollification will be held. One car will leave Blaine on the Canadian boundary, while the other will make its departure from Portland on the Oregon side of the Columbia river. The entire distance of more than 300 miles will be observed and checked officially.

As the two cars meet they will be welcomed by Governor Ernest Lister, with state, county and good roads officials and representatives of motor car clubs. The Oregon car will bear a letter from Governor Withycombe, while the car from the Canadian boundary will have a letter from the Premier of British Columbia. This will be brought down to Blaine from Vancouver, B. C., by representatives of the McLaughlin Buick Co.

The cars used are Buicks contributed by the Oregon and Washington distributors. As they meet, 112 miles of continuous paved highway across Washington, forming a link in the Pacific highway, will be formally opened by the state highway commissioner.

ENGLAND REDUCES GASOLINE

London, England, Dec. 1—The price of gasoline in England has been reduced 4 cents per gallon. With all due respect to the oil companies this is simply a fictitious reduction because the companies raised the price 17 cents per gallon two months ago and consequently are now in good condition to bow to public opinion and reduce the price.

On Nov. 1, when the new regulations went into force restricting the use of gasoline, motorists turned their attention to coal gas and to-day there is a tremendous movement in that direction. All makers of gas bags, which are carried on the tops of

cars, and compressed gas cylinders, which are carried on the running boards or other places, are flooded with orders, some makers having twelve months' orders on hand.

Naturally the government authorities are more or less concerned because of this diversion of labor from what is known as more useful work, and it is confidently expected that within a few days restrictions may be introduced preventing the use of coal gas except by those who are entitled to use gasoline. This is not so unreasonable as it might appear, for at a time when all householders are asked to conserve gas supplies and are only supplied with coal on a rationed basis, it is clearly wrong for people to be able to use unlimited supplies of coal gas in their motor cars.

PARIS WITHDRAWS GASOLINE

Paris, Dec. 3—French motorists were put on a complete war basis this month by the withdrawal of all permits to purchase gasoline for touring or private cars. For a considerable time the owners have been furnished with gasoline cards which allowed them first to purchase 66 gal. and later 22 gal. a month. Cards were renewed as usual in November, but a little later a notice was issued to the effect that these cards could not be honored. It was intimated at first that the measure would be only of a temporary nature and had been adopted to allow the authorities to get the military reserves above the minimum figure considered necessary in the interests of the forces. Later, owners have been made to understand that the present restrictions may continue for a considerable time, for it is essential that the army should have a plentiful supply for the present and the immediate future.

AERO SHOW IS DROPPED

New York, Dec. 21—The aircraft show, which was to have been held in Grand Central Palace Feb. 16-23, has been called off. This action was taken by the organization committee of the Second Pan-American Aeronautic Exposition with a view to directly assisting the Government by eliminating any further congestion of the railroads which such an exposition would necessitate. In place of the exposition there is to be a series of aeronautic conferences.

TO DISCUSS MOTOR BOATS

New York, Dec. 22—A special meeting of the Society of Automotive Engineers for the consideration of subjects relating to motorboat matters will be held in this city on the Friday evening of the week of the annual motorboat show, which is scheduled for Jan. 19-26 inclusive. This meeting, which will take the form of an afternoon and evening session with a dinner sandwiched in between, will be held on Friday afternoon, Jan. 25. The afternoon meeting will be held at the S. A. E. headquarters and the dinner and the session will be held at the Automobile Club of America.

The consideration of engines for motorboats will occupy most of the afternoon program. One of the subjects deals with the Deisel engine and the other with engine design for submarine chasers, etc. "Developments and Improvements in the

Deisel Engine in the U. S. A." is the subject to be handled by James Craig of the Craig Engineering Co., a large builder of those engines. "Engineering Fundamentals in Low Speed Engines for Motor Boats" will be an address by E. A. Riotte of the Standard Motor Construction Co., which is one of the large manufacturers of such engines. After the dinner at the Automobile Club of America, two or three papers will be presented. Erwin Chase, engineer of the Submarine Boat Corp., will speak on "Equipping Our Transports with Motorboats."

COMBINED MOTORS NARROWED

Chicago, Dec. 22—The Combined Motors Corp., which according to earlier reports was to be a merger of three car builders and a body maker, has completed its organization work. As it stands finally, it combines the Bour-Davis Motor Car Co., which has made the Bour-Davis, and the Shadwyck Brothers Co., producing the Shadwyck six. Neither the Dixie Motor Car Co., Louisville, Ky., making the Dixie Flyer, or the Collins Body Co., St. Louis, Mo., both originally reported to be in the combination, are included in the merger.

B. L. Craig, president of the R. N. Collins Vehicle Co., St. Louis, has resigned as president of the newly organized combine. He says that the Combined Motors Corp. has no option on the Collins plant and that his company will not enter the combine. Mr. Craig does not explain why he was elected as head of the new concern.

ROAD BUILDERS TO MEET

New York, Dec. 21—The fifteenth annual convention of the American Road Builders' Association will be held at St. Louis, Mo., Feb. 4-7. Owing to the difficulties of railroad transportation it has been decided to abandon for this meeting the exhibition of road-building machinery, materials and appliances which for several years has been an important feature of the conventions and to limit the good roads show to such display of materials, models, etc., as can be shown in the large ballroom of the Hotel Statler. It is expected that the St. Louis convention will be the only large gathering of road builders and users which will be held during 1918.

TRACTORS SHOW AT CLEVELAND

Cleveland, Ohio, Dec. 22—The national exhibition of the tractor and thresher department of the National Implement & Vehicle Association will be held here next August. The headquarters and main exhibit will be at the Good Gold farm near Willoughby, where 4000 acres of land are available. It is expected that the exhibit will be larger than the last one held at Fremont, Neb., where forty-eight tractors were exhibited. The exhibition in this city will be one of eight to be held in the country next year. Five tractors already have applied for space in the Cleveland show, which will be held Jan. 19-27. These are the Happy Farmer tractor, the J. T. Tractor Co., the Avery, the Case and the Cleveland.

Truck Train Expected at Capital Soon

Seventy-eight Men of Army Transport Spend Christmas as Bedford, Pa., Guests

WASHINGTON, Dec. 24—Special telegram—The arrival of the first section of the Army's new truck transport service, which left Detroit overland for the Atlantic seacoast last week, is expected here in a few days. The trucks passed through Ligonier, Pa., last night after a hard day's drive in which 47 miles were covered. The train left Pittsburgh at 10 o'clock Sunday morning after some lectures on the science of mountain travel with 3-ton trucks. The route was over well paved roads but very hilly ones, many of the grades being as much as 20 per cent. Every truck made the heavy grades under its own power, however. Some snow was met but after the first half dozen of the thirty trucks plowed through it was easy going for the rest in comparison.

Enthusiastic crowds have greeted the trucks all along the journey. To-day the train is due to stop at Bedford, Pa., where the seventy-eight drivers, cooks and mechanics will spend Christmas as the guests of the city.

A train struck one of the trucks at a crossing about 10 miles from Warren, Ohio, killing the driver. The convoy is moving slowly under orders from the Quartermaster Corps, which wants them to gather as much experience on the trip as possible. There has been considerable snow trouble, which points to the fact that the state legislature will be required to keep the roads clear. Ohio, Pennsylvania and all states en route are co-operating with the Highways Transport Committee to the fullest extent. Captain Buttcher of the engineering corps is making observations on roads and bridges, and H. C. Ostermann, Lincoln-highway Association, is doing the observation work for the Highways Transport Committee.

If the truck train proves successful, it is estimated that the total relief to the railroads, through the shipment to the coast under their own power of the 30,000 war trucks the Army has under construction, will amount to 690,000 tons. The trucks have an average capacity of 3 tons, and only two of them can be shipped by rail in a 40-ton freight car. The new plan would relieve 15,000 40-ton freight cars and also permit the transportation of 90,000 tons of Government materials to the coast from the interior storage depots. The actual number of freight cars which will be relieved will be 17,250 40-ton cars.

MAXWELL 1-TONNER STILL GOING

Detroit, Dec. 22—So well has the Maxwell stood the long grind with its 1-ton load groceries for Atlanta that it has gone on to Jacksonville with another 1-ton load from Atlanta. All army camps near the roads followed have been visited. To reach the quartermasters' department many times it has been necessary for the truck to cut across lots, ditches, cotton fields and worm its way through unbroken

woods paths. The truck has been making as many as 12 miles to the gallon.

Meanwhile two other Maxwell trucks have been showing their ability. Running over a road in opposite directions in an inter-city contest each made an average of 13.3 m.p.g. of gasoline. The demonstration took place over the road between Dallas and Fort Worth, Tex., which is 35 miles.

NAVY PLANT NEEDS WORKERS

Washington, Dec. 22—The aircraft factory at the Philadelphia navy yard now completed and in operation needs immediately 2000 skilled workers of all kinds to bring it up to capacity production. There are places for machinists, sheet metal workers, wire workers, wood workers and also for many women. The new plant will produce only a portion of the flying boats needed for the Navy but will be used extensively for experimental work on new types of seaplanes.

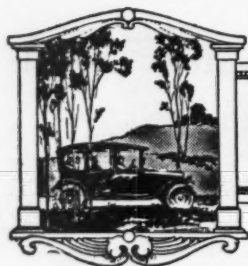
Men with practical experience in constructing and repairing motor car engines are in demand for ground service in the Navy Flying Corps. After instruction enlisted men are eligible for appointment as first- and second-class petty officers in the corps. On the basis of ten men to every flyer about 8000 mechanics will be necessary to complete the organization of the corps. Enlistment in the Naval Flying Corps now stationed at Great Lakes, Ill., is by application to Lieut. Lee Hammond, U. S. N. Training Station, Great Lakes, Ill. An excellent opportunity is offered now so the skill of men expert in this work may be utilized in preparing and maintaining seaplanes.

ARMY TAKES 2000 SKILLED MEN

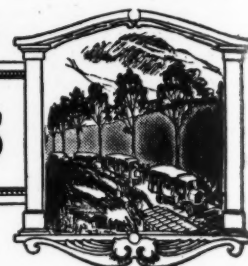
Detroit, Dec. 22—The United States government has requisitioned many skilled men from the factories to care for the maintenance of motor cars in France. It is estimated that about 2000 men have been taken from the Ford, Packard, Pierce-Arrow and other plants supplying trucks to the Government.

DETROIT CONVICTS CAR THIEVES

Detroit, Dec. 22—As a result of the campaign against motor car thieves, in the last three months sixty-four thieves have been sentenced to prison terms, either in the state penitentiary in Jackson or in the Detroit house of correction. These sentences range from five months to five years, and in all only fourteen men have been acquitted. About seventy cases are pending, and several have been paroled. About 3000 cars have been stolen since the first of January. The success of the campaign is directly due to the hard work of the police force, with the co-operation of the Detroit Automobile Club.



EDITORIAL PERSPECTIVES



Motor Contributions to 1917

THE year 1917, being the first year of America's participation in the war, will go down in American motor history as one which saw the beginning of a number of movements of first importance to the motor industry. These are movements which it is believed will radically change the character of the industry throughout its succeeding annals. Some of these big movements have been in process for years before the dawn of 1917, but it took the entrance of America into the European war, and conditions which this entrance brought about, to make these generally recognized. Eight of these great trends, many of which are inter-related and all of which have come to general recognition through war-time needs, may be stated as follows:

- 1—Value of motors to warring nations.
- 2—The word "pleasure car" a misnomer.
- 3—Poor economy of horse as source of power.
- 4—Widening of the principles of standardization.
- 5—Co-operation of the industry for war work.
- 6—Reduction of gasoline waste.
- 7—Need of motor trucks for short hauls.
- 8—Need of military roads.

WHEN a nation goes to war, the vast increase in the requirements for supplies, both the strictly military and the more general supplies for the sustenance of the troops, requires a vast increase in the production facilities and in most instances a change in the character of its production. When a nation, in addition to supplying its own millions of troops, must supply other nations, as in the case of America, not only with the material for warfare but also for the sustenance of the inhabitants of these other nations, the war-time enlargement must be many times greater.

WHILE the primal requisite in such a position is greater production from the soil, this can be obtained in two ways, one by greater intensification so that there is greater production per acre, and the other by an increase in the productive acres. Along with this call for greater agricultural production, the farmer is confronted with a shortage of labor, high wages and greatly increased cost of keeping horses. These conditions make it necessary for him to increase his own efficiency and that of his men, as well as that of his land.

IN accomplishing this the farmer must come to greater use of time and labor-saving machinery, just as manufacturers have had to do. The farm tractor affords the means of increasing both the production per acre and the number of productive acres without hiring more men or even more horses. The motor car and truck furnish a means of independent transportation, more necessary now than ever before. Higher speeds of motor transportation enable the farmer to take advantage of favorable road and weather conditions and make motor hauls direct to market, thus relieving the critical freight congestion on the railroads. Similar conditions arise in considering the motor car in the service of men in other businesses than that of farming. The motor car has become a business vehicle, even though it

be of the type not designed for carrying other freight than human.

IN other words, the word "pleasure car" is out of place in war-time, more so than ever before. When a motor car is purchased today, quick transportation is what is being purchased. The motor car is increasing the efficiency of production, by increasing the speed of transportation, whether it be of man or goods. The passenger car is no more of a pleasure vehicle than the farmer's plow. A daily paper recently summed up the situation in the question, "Would you call your two feet a pleasure vehicle?" and answered it, "Certainly not. Then don't speak of an automobile as a pleasure vehicle. It is simply a better pair of feet and also a pair of wings."

ONE of the biggest factors in the military development of the present war is the motor vehicle. So much has been said regarding this that it is only necessary to mention the motor vehicles that saved Paris in the fall of 1914, when the 4000 trucks and cars in an endless procession 30 miles long made possible the successful defense of the line at Verdun. The crushing of the Hindenburg line before Cambrai was made possible by the power of the tanks. Much of the mobility of the heavy artillery was due wholly to the use of motors. While no definite figures are available, it is certain that there are in the neighborhood of 120,000 motor vehicles in the war zone, over 50,000 of which have been supplied by the United States.

GREAT as has been this gathering of cars, on the European battle front it has been made possible only by another angle of mobilization of the motor vehicle. The entire motor car industry of America, including owners as well as makers, is mobilized for war. In the 4,500,000 motor cars and trucks registered in the United States, there is represented a manufacturing capital of over \$735,000,000, and a great proportion of this now has been turned into production of either motor vehicles and their parts or war munitions along similar lines. Government contracts totaling \$50,000,000 or \$60,000,000 to single factories are not unknown.

WHAT this has meant in the training of skilled men for production of war materials, in putting into circulation millions of dollars to be drawn on by the government in financing the war, can be realized from the fact that 1,806,200 motor vehicles were produced up till June, 1917, which cost wholesale \$917,500,000, representing nearly \$500,000,000 for parts and materials alone. A census of the industry at that time showed 280,000 people employed in turning out completed vehicles and an additional 320,000 making parts and accessories. In addition, there are the dealers and garages representing 240,000 men, with a payroll of nearly \$200,000,000 a year.

IF money had not been contributed by the people for motor cars there would be no motor car plants. There would not be the 1,000,000 workers in the industry. There would be no motor cars to stop the oncoming rush of the Germans at Verdun.

Not only this, but American motor car owners helped directly with the financing of the war by their payment of \$33,000,000 in taxes for car registrations and chauffeurs' licenses.

IN spite of all this, the War Industries board at Washington recently threatened the very existence of the industry by an order designed to deprive manufacturers of passenger cars of the alloy steels which the passenger car industry evolved and which made possible the production of the modern big guns. True enough, this order regarding alloy steels, which was based on the idea that so-called "pleasure car" was a non-essential, has been withheld temporarily, at least, by the appointment of a committee of men in the industry to co-operate with the War Industries board, but the attitude of the Government, not to mention the uncertainty throughout the entire fabric of the industry from manufacturer to prospective buyer, has not been entirely allayed.

MILITARY experts have found that animal traction for war purposes has had to be replaced very largely by motor traction. There are other reasons for this, but one of the chief ones is the fact that effective hauling capacity of the animals is cut down too much by the great quantities of food which must be hauled for the animals themselves. America is beginning to see that the basic principle of this is true on the farm as well as on the field of battle. With every effort needed for sending all the food possible to Europe, the folly of cutting down the available acreage by use of horses for farm work where motors can be used is becoming more and more evident. It requires five acres of farm land to produce the food consumed each year by a single horse, and there are now in the neighborhood of 25,000,000 horses in the United States. The amount of acreage devoted to keeping them alive is more than sufficient to feed the entire human population of the country. At that, the horse is computed to be only 2 per cent efficient. Edison sums it up when he says, "The horse is too expensive to keep."

AMERICA'S call to her citizens in putting her forces into the field properly equipped gave the motor industry its greatest opportunity and made possible the application to the national business of two principles which have made the motor industry what it is. These are the twin ideas of standardization and co-operation in an industry. When President Wilson needed a man to take charge of the high-speed production of aircraft he went to the motor industry and took Howard Coffin. Without the motor car there probably never would have been an aircraft industry, because the motor car makers developed the gasoline engine to a point where it could be used with reliance in the air. Also, it developed the alloy steels, which made possible the aircraft engine. Along with Coffin were taken big men from the industry throughout the country. The engineering experience and executive ability of the Society of Automotive Engineers, together with the co-operation of the manufacturers, has given the Liberty aviation engine and the standardized motor truck, as well as the engines for the thousands of submarine chasers.

THROUGHOUT the military organization as well as the civilian boards which are carrying on the war work, the men of the automotive industry will be found. Hundreds of executives from the factories have been commissioned as officers, for this work would be impossible without them. The Government called on the industry and the many organizations within it as a direct means of recruiting and training the thousands of experienced men required to handle motor-driven war machines.

ONE of the movements which came about through the need of conservation and which will have a permanent effect upon motoring as a whole, was the campaign for the reduction of gasoline waste. We furnished the allies last year approximately 360,000,000 gal. of gasoline. We produce daily 6,850,000 gal. and the war needs of the Allied armies are something under 1,000,000 gal. a day. Less than a sixth, therefore, must be turned over from ordinary use to war use. Approximately this amount, according to the National Automobile Chamber of Commerce, can be saved by applying proper principles of conservation. This means that not by curtailing the use of the motor car but by eliminating such wastes as are caused by too-rich mixtures, leakage, use of gasoline for washing, etc.

ONE of the features of war development in motordom which will have a steadily increasing effect is that of the recognition in transportation circles, and particularly by the Government, of the utilization of motor trucks in relieving the overcrowded railways. This takes its most important phase in the use of motor trucks for transportation of goods over short distances. Systems for co-operating with railroads in this way are being put in force in many railroad terminals and between large cities not too widely separated.

WHEN our military operations commenced the Government woke up suddenly to the fact that we have very few roads over which large convoys of motor vehicles could be driven. The Highways Transport Committee was appointed with a motor car manufacturer at the head, and one of its first jobs was to send out pathfinders over routes between strategic points and bases of supplies to find the most feasible roads for sending overland the war trucks. Some few roads are found possible for efficient transportation for motor truck, and our war trucks are now being delivered overland, in some instances loaded with war supplies. This is the first real military use of America's highways and certainly will mean a wonderful development in systematic highway improvement under Federal control.

On the New Year's Trail

By John B. Terns

The old year sets with the last day's sun—
Too late for the good we might have done,
Too late for the act in a friendly stead,
But the New Year breaks with a chance ahead;
Let us pledge our cars through the budding year
To a more unselfish and kind career,
To a service based on a better plan,
The ready relief of our fellow-man.

Oh, a car a mission worth while fulfills,
Or a selfish end, as its owner wills,
And how much better it is to extend
The comforts we know of our cars, my friend,
Than wrapping ourselves in arrogant pride,
Thoughtless of others to be as we ride;
We know no thrill that can quite compare
To that which comes with the joys we share.

As the fresh sands into the year-glass drift,
Let us be more ready to lend a lift,
More ready to offer a ride each day
To the man on foot who is bound our way.
And while we are planning our week-end tours,
Let there seldom be in my car and yours
Any vacant seats to reproach our sight
At thought of the friends we did not invite.

So we start our drive on the New Year's trail,
With our cars tuned up to a higher scale,
With a lift held out to the pal we meet,
And a human note to the engine's beat.
Our hearts are our milestones, the way is sure—
It's a straight drive through, and there's no detour.
Why, the goal draws near; I can see it come—
It's a fairer place than we started from.

Car Industry's Coal Need More Acute

Makers Run Plants on 24-hr. Basis—Resolution for Advisory Board on Fuel Situation

DETROIT, Dec. 22—The coal shortage situation daily is growing more acute, and there is no immediate relief in sight. Today, manufacturers as a whole are running on a 24-hr. basis, some possess enough for three weeks' production and a very few are fortunate enough to have a supply that will last for a month or two. Here and there some of the smaller plants have closed, but borrowing back and forth, small shipments, etc., have enabled the plants to keep running. And the manufacturers do not welcome the suggestion that they close down through the holidays, stating that the remedy is worse than the disease.

This, in brief, is a review of the coal situation, as shown by a mass meeting held here tonight. More than 300 were present, including heads of manufacturing concerns, coal operators, coal dealers and traffic men.

Suggestions have been received from various sources that the plants shut down over the holidays to relieve the situation and enable the private individual to get a supply of coal for his immediate needs. One of the largest of the city's makers voiced the sentiments of the manufacturers in a letter to W. K. Prudden, state fuel administrator, when he wrote: "I am absolutely not in favor of closing down as a means of relieving the situation. The manufacturer knows his own business best, and whether he closes or does not close is a question that he can best decide for himself." It is on this basis that the manufacturers are acting. Closing the plants was not for one minute considered by the meeting.

Resolution Adopted

The immediate action of the citizens was to adopt a resolution to go to President Wilson and the National Fuel Administration for the appointment of an advisory board composed of representatives from the railroad and coal industries.

At the opening of the meeting, Chairman Arthur T. Waterfall, traffic manager of Dodge Brothers, reviewed the coal situation to date and emphasized the point that the scarcity in the industries can be blamed only to the industries themselves. For last winter a similar shortage, though less acute, occurred, and the manufacturers had all summer in which to obtain a supply. Dodge Brothers did obtain such a supply, and to-day are about the best situated of the manufacturers. Last April a representative from the Dodge Brothers factory went to the coal mining country to study the cause of the shortage. It was found that though the consumption had increased, the production had increased 50,000,000 tons in the preceding six months.

This condition, with the railroad situation, caused Dodge Brothers to buy coal for the coming winter—and though other manufacturers had the same warning, as a rule, it was not done. To date, 5000 men out of 16,000 employees at Dodge Brothers have asked for coal, and about 160 deliveries are being made daily.

Terminal facilities have not increased as fast as the demands. In the last five years the number of manufacturers has increased from 460 to 1000. During that time each manufacturer has depended upon the coal dealer to have a carload of coal beside his boiler room when it was needed and carried no reserve supply on hand. The dealer always had handled his coal problem, until last winter he always had had coal and hence did not heed the warning and stock up. In obtaining coal the manufacturers have not used the same business care and foresight as they have in obtaining materials of construction from other sources of supply.

COFFIN ON AIRCRAFT SITUATION

Washington, Dec. 22—Howard E. Coffin, chairman of the Aircraft Production Board, following a trip of inspection returned here extremely optimistic as regards airplane conditions. He said:

"The material conditions in airplane development are satisfactory; we now want the men to come as fast as the machines. Every effort is being made to co-ordinate effort in aviation work with our allies and to reach standard types of design in the machines. There unquestionably will be machines built in a reasonable length of time capable of flying across the Atlantic."

Mr. Coffin stated that the many reports about defects in the Liberty engine are entirely without foundation, that the engine had met every requirement in speed and altitude efficiency under actual tests and that it would stand up against those being used by Allied nations and he pointed out for proof the fact that Allied nations already have placed orders for the American engines. He spoke also of the flying schools he recently visited and characterized them as most inspiring characters.

"This branch of the service," he said, "is getting the highest type of Americans. Their examinations and the character of the training insures that. While there must be ample time for the present demand there must also be more for the future. In this connection young men should consider that a knowledge of engineering, mechanics or actual flying in connection with aeronautics will have a decided peace-time value. We may beat up cannon into plowshares to paraphrase an old quotation, but the airplane is here to stay and I predict that its commercial development after the war will be surprising."

JACKSON MAKERS CO-OPERATE

Jackson, Mich., Dec. 22—The manufacturers of this city are adopting a plan for handling Government work in a co-operative manner. Each manufacturer joining the movement pays a fee of \$50, this permitting a competent engineer to be hired, make a survey of the factories and represent the manufacturers in the capital. The

factories receiving contracts will be required to pay a pro-rata tax to cover the expense involved. To date, the following are the automotive companies that are backing the movement: Sparks-Withington, Perlman Rim Corp., Alloy Steel Spring & Axle Co., Jackson Automobile Co., Briscoe Motor Corp., Frost Gear & Forge, Hayes Wheel Co., Mott Wheel Works, Jackson Cushion Spring Co., Frost Machine Co., Jackson Carburetor Co., Jackson Metal Products Co., Lockwood-Ash Motor Co.

COAL SHORTAGE CLOSES PLANTS

Saginaw, Mich., Dec. 22—Coal shortage has temporarily closed about forty plants in this city, the only exceptions being those working on Government contracts for war materials, transportation, telephone, telegraph and newspaper companies. Those closed receive their power from the Consumers' Power Co. Among the motor car and allied industry plants closed are the Jackson-Church-Wilcox Co., the Erd Motor Co. and the Nelson Brothers Co. The Saginaw Motor Co. is as yet not affected, as it still has coal on hand.

NELSON COMPLETES FIRST TRUCK

Saginaw, Mich., Dec. 22—The Nelson Bros. Co. has completed its first 2-ton truck and fifty more are planned within the next two months. These are to be styled the Jumbo trucks, and an addition will be made to the factory so that nearly all the units can be manufactured. At present the truck is being assembled. The price has not yet been determined.

GIRL'S DUTIES INCREASE

Washington, D. C., Dec. 24—Special telegram—Christian Girl's duties have been enlarged and in addition to being chairman of the Military Truck Production Board he now heads the quartermaster mechanical transport engineering, in charge of completion of designs of trucks and other quartermaster engineering.

PAIGE TO MAKE TRUCK

Detroit, Dec. 22—The Paige Motor Car Co. has taken over part of the plant of the Williams Pickel factory and will use it in manufacturing a new commercial truck. Immediate steps are being taken to place the truck in production. However, it will be some time before the truck is placed on the market.

STYLES IN MISSOURI LAWS

St. Louis, Mo., Dec. 24—Cut-outs will not be in style on Missouri motor cars next year. Spotlights will be worn, visibly, only on country roads. All regular headlights will be moderate in intensity and worn low. Number plates will be worn front and back and chauffeurs, other than car owners, will wear conspicuously a numbered badge for which each will pay \$1.50. Secretary of State Sullivan has just issued an advance bulletin on styles as described by the law which becomes effective Feb. 1. The light regulations are similar to those in force in many states.

Dirigible headlights can not be used on the public highways within cities or towns,

except in emergency, or when the headlights are inadequate and then only provided the shaft of condensed light is directed downward below the middle of the lamp and at no time into the eyes of persons. Searchlights may be used on public highways outside the limits of cities and towns, provided the light is directed downward.

Muffler cut-outs can not be used either. Any cut-out or opening in the exhaust pipe, between the engine and muffler on any car, must be completely closed and disconnected from the operating lever, and so arranged that it cannot automatically open or be operated while the car is in motion.

SAXON ORDERS PILE UP

Detroit, Dec. 22—Orders for Saxon cars received last week totaled over 300 cars, and most of these were for immediate delivery. Monday ninety-four orders came in, and Tuesday 279 orders were received. These came from New York, Louisiana, Oklahoma, California, Texas, Indiana, Pennsylvania, Florida and Michigan in the main, though orders were also received from other states. It will be noted that most of these are southern and southwestern states, and it is in these districts that business is best.

FORD TRACTOR AT CAPACITY

Dearborn, Mich., Dec. 22—The tractor plant of Henry Ford & Son is working night and day, with three shifts of men, turning out tractors for the English government. At present about 1400 men are employed, and constant shipments are being made to England. It is expected that the English order of 6000 tractors and 1000 parts will be filled about Feb. 1, and it will be at the present rate of production increase. The order pending with the French government has not been completed.

MORE CLOSED CARS SOLD

Detroit, Dec. 22—The Cadillac Motor Co. is working on passenger car production to full capacity, and nearly half the cars produced are of the inclosed type. To be exact, 40 per cent of the present models are inclosed cars, and the number shipped to date is much larger than at this time last year. From statistics, it has been shown that of owners who previously have owned Cadillac cars, 37 per cent have been inclosed car purchasers.

FRANKLIN ORDERS FOR CAPACITY

Syracuse, N. Y., Dec. 22—The Franklin Automobile Co. has orders on its books that will require six weeks' production at full capacity to fill. Compared with the ten weeks' unfilled orders of the busy spring season, the comparison for the slack period is favorable.

M. & A. M. DINNER DATE

New York, Dec. 22—The tenth annual dinner of the Motor & Accessory Manufacturers' Association will be held at Hotel Waldorf-Astoria on Wednesday, Jan. 9, at 7:30 p. m. The date has been arranged so that the dinner will be one of the events of show week.

Coal and Freight Problem of Industry

Several Factories Obtain Power from Their Own Products as Shortage Relief Measures

DETROIT, Dec. 22—The coal and freight car situation still continues to be the largest problem the motor car industry has to face, and conditions are about the same as last week. Several factories throughout the state are closed for lack of fuel, and the state fuel administrator is in Washington taking the negative method of relieving the situation—namely, proposing that all factories not producing war materials or necessities close for a week or two over the holiday season. This doubtless would throw a half million men out of work at a time when they need work most, and would make easy the same procedure the next time coal became short.

Several factories are obtaining their power from their own products, that is, using gasoline or kerosene engines to run their plants. The Hupp Motor Car Co., in its axle plant at Jackson, is using engines to replace 25 hp. motors. In Cadillac, Mich., the Acme Motor Truck Co. is using its truck engines for the same purpose, and the Erd Motor Co., Saginaw, Mich., is preparing to do the same thing.

Skilled labor is scarce, though the contrary is true with unskilled labor. A good latheman, working on piece work, often earns from \$10 to \$12 a day, and is not easy to obtain at any price. It is not to be understood that any man, working at a lathe or grinder can do this, but for a man that is actually good, such pay is the rule.

The reason for the amount of unskilled labor is that the summer resorts, lake boats, etc., have ceased business for the winter, combined with the fact that building trades are quiet. Also there are many that want inside work during the winter and others attracted here by thoughts of easy money. When quantity work on war material production actually starts, it is this unskilled labor that must be whipped into shape to carry on the work.

In Cleveland all plants were shut down Friday and Saturday of last week, and about 75,000 workmen thrown out of work, due to coal shortage. Among these were the Grant-Lees Co., Baker Motor Vehicle Co., Lucas Machine Tool Co., Westinghouse Electric Co., Hydraulic Pressed Steel Co., Chandler Motor Co., Willard Storage Battery Co., Cleveland Bronze & Brass Co., Cleveland Welding Co., Aluminum Castings Co., Perfection Spring Co., Standard Welding Co., Cleveland Steel Castings Co., Peerless Motor Car Co., Vlecheck Tool Co., and many others. However, on Sunday coal bearing lake steamers were seized and to-day the plants are operating. But they are operating on the same day-to-day basis as the Detroit plants.

Reo is about 3500 cars behind orders due to freight car shortage. It has 344 stars in service flag out of 4000 employees. The coal situation is fairly good and it is tooling up for manufacture of creeper tractors on Government order. Reo gave each employee a \$5 war stamp for Christmas.

The Flint plant of Chevrolet closed this week for inventory. It is expected the coal

situation will be relieved when it reopens Jan. 2 and all completed cars now on hand will have been shipped. It closed one day last week because of coal shortage.

HARRY W. FORD RESIGNS

Detroit, Dec. 22—As announced in MOTOR AGE, Harry W. Ford relinquished active control of the Saxon Motor Car Corp. on account of poor health, and was planning to take a long vacation. His actual resignation, to take effect immediately, was accepted this week at a special meeting of the board of directors. Mr. Ford, however, continues a director of the corporation. It is not known who will succeed him as president, the general managership of the company being in the hands of Charles A. Woodruff, former purchasing agent of the Chalmers Motor Corp., as it has been for some time. Shortly after the Christmas season, Mr. Ford will leave for the West, and it is understood that he has no definite plans for re-entering business.

CASSIDY TO DISTRIBUTE RAJAH

New York, Dec. 24—The Edward A. Cassidy Co. has taken over the distribution of the Rajah spark plug, which has been made for sixteen years by the Rajah Auto Supply Co., Bloomfield, N. J. The company will continue its manufacturing as usual, Cassidy merely acting as a sales department. The Cassidy company is acting in a similar capacity for the Corning conaphore, Corning Glass Works, Corning, N. Y.; G. P. muffler cutout, Long Horn, G. Piel Co., Long Island City, N. Y.; Casco engine-driven tire pump, West Side Country Co., Troy, N. Y.; Kimball jack, F. W. Mann Co., Milford, Mass.; Tenion piston ring, Dubois Piston Ring Co., Albany, N. Y.

WEIGHT TAXES CARS

Chicago, Dec. 24—Idaho is the first state to make the motor car pay taxes on the basis of weight. A law passed at the last session and approved by the governor issued licenses according to the following: 2000 lb. or less, \$15; between 2000 and 3000 lb., \$20; between 3000 and 4000 lb., \$30; and above 4000 lb., \$40.

RACING MEN ENLIST

Chicago, Dec. 22—O. F. Haibe, race driver, and Harold Smith, formerly Ralph Mulford's mechanics, have enlisted in the aviation section of the Signal Corps. Both will serve as instructors.

HONGKONG DEVELOPS CAR

Hongkong, China, Nov. 16—The use of motor cars in Hongkong is comparatively limited, but at present there is what might be classed as a motor car boom in the colony. The government is planning a comprehensive system of road building and improvement and, in fact, already has started actual work on roads that will extend the use of the motor car. The wealthier Chinese have taken to motoring enthu-

siastically and are the best customers of the public garages. The use of cars by private owners generally is on the increase.

The number of cars in use has grown rapidly during the last few months. The colony now has 125 cars and 118 motorcycles, compared with 105 cars and 91 motorcycles in December, 1916. A canvass of the dealers indicates that between twenty-five and thirty new cars have been ordered, all from the United States. Most of them are popular priced, but there is an increasing demand for the higher ones. An order for eleven placed by one garage included five of high grade. In spite of excessive freight rates the demand promises to continue for some time.

AIR NEWS IN BRIEF

Chicago, Dec. 21—Further details of the 2000-mile flight of the Handley-Page battleplane from the outskirts of London to Constantinople, where it bombed the city and the German cruiser now with the Turkish army give details in regard to beds, bedding, boxes of spare parts and tools for the engines, supplies equivalent to another engine and ammunition, all carried by the one plant. In addition to the pilot, Lieutenant McClellan, Lieutenant Rawlings, an engineer and two mechanics were in the party of seven which made the trip. The equipment weighed more than 6 tons. The flight was by Paris, the Rhone valley, Marseilles, Pisa, Rome and Salonika.

Though Government regulations have made it impossible for the offer of Miss Ruth Law to be accepted by the Army Signal Corps because she is a woman, another woman aviator, Miss Katherine Stinson, has established a new official American non-stop record for airplane flights, between San Francisco and San Diego, covering the 610 miles in 9 hr. 10 min. The Pacific Aero Club timed and supervised the flight, which surpassed the previous non-stop record of 512½ miles made by Miss Ruth Law Nov. 19, 1916, between Chicago and Hornell, N. Y.

British Car Restrictions

Necessities Only Plea of Avail to Owners in England Since Nov. 1

Fuel License Required from Every Motorist

LONDON, England, Nov. 15—Nov. 1 the new order respecting restrictions on the use of gasoline or other motor spirits for motor cars in this country was enforced. In this connection every motorist must have a fuel license. The illustrations herewith show the form of license used. Under these new regulations the use of gasoline is limited to necessities.

Gasoline or gasoline substitutes can be used since Nov. 1 for the following purposes:

In the conveyance of a person or goods to or from the nearest convenient railway station in connection with a railway journey and where no other means of conveyance is reasonably available.

For the purpose of the profession, trade or business carried on by, or the necessary household affairs of, the person on whose behalf the motor vehicle is being used where the journey cannot otherwise be reasonably and conveniently accomplished, provided that the conveyance of a person for the whole or part of the distance between his residence and place of business shall not be deemed to be a journey undertaken for the purpose of his profession, trade or business if railway or other means of communication be reasonably available.

In the performance of any public duty for the whole or part of a journey which cannot otherwise be reasonably and conveniently accomplished either in whole or in part.

On any sudden or urgent necessity, where life or limb is or may be endangered.

In the performance of ambulance work or for the purpose of attendance upon a sick or injured person where such attendance cannot otherwise be reasonably provided.

For funerals.

In the conveyance of a duly qualified medical practitioner or veterinary surgeon while it is being used by him for the purpose of his profession.

For the purposes of the Red Cross Society, Saint John Ambulance Association or any similar Red Cross Society approved by the Admiralty or Army Council or by the Allied governments.

For driving a motor vehicle which is constructed or adapted for use, and is used solely for the conveyance of any goods or burden in the course of trade or husbandry, and whereon the Christian name and surname, and place of abode or place of business of the person, or the name or style and principal or any place of business of the company or firm keeping the same, shall be legibly and visibly painted in letters of not less than one inch in length.

For driving any motor vehicle licensed to ply for hire, provided that nothing herein contained shall be deemed to affect the restriction placed upon the use of motor spirits by a char-a-bancs and other like vehicles under Regulation 8 of the Defence of the Realm Regulations.

For driving any other motor vehicle being a hackney carriage for any purpose for which it has been specially authorized to be driven by the Board of Trade during such time as such authority is in force.

For driving a motor vehicle which is a motor fire-engine or other vehicle being used for fire brigade purposes, or a motor ambulance.

Where a special authority in writing has been granted by the Petrol Control Department of the Board of Trade.

Petrol or petrol substitute may be used for the purpose of driving a motor fishing boat or other motor boat used for the purpose of the profession, trade or business (other than the trade or business of letting motor boats for hire or for conveying passengers on pleasure trips) carried on by the person on whose behalf the motor boat is being used; or for driving a motor tractor or motor plough used for the cultivation of land or other agricultural purposes; or for driving a motor sweeping or watering machine or other vehicle used for sanitary purposes; or for purposes other than the provision of motive power or motor vehicles; provided that the petrol or petrol substitute, if subject to duty as a motor spirit under Section 84 of the Finance Act, 1910, must be obtained in accordance with the provisions of a motor spirit license issued by the Petrol Control Department of the Board of Trade.

The proof of the purpose for which the motor vehicle is used shall in all cases lie upon the person using or causing the use of the petrol or petrol substitute.

GOETHALS RETAINS PLANE JOB

Washington, Dec. 24—Special telegram—Major-General G. W. Goethals remains president of the Wright-Martin Aircraft Corp. in spite of his appointment as acting head of the quartermaster department.

DIXIE ADVANCES PRICES

Louisville, Dec. 22—The Dixie Motor Car Co. has advanced its prices effective Dec. 19. New prices are touring and roadster, \$995; sedan, \$1,375.

DUPLEX TO INCREASE PRICE

Lansing, Mich., Dec. 24—The price of the Duplex four-wheel drive truck will be advanced from \$3,600 to \$4,000 Jan. 1. This includes the war tax.

CO-OPERATIVE MOTOR DELIVERY

The town of Bloomington, Ill., may not be large in comparison to Chicago or New York, but here's how it is helping solve the delivery problem. It is a plan that might be worked out in any town with advantage to that town.

The Bloomington Co-operative Delivery System was inaugurated last week and the majority of the business men of the city have become members. A central depot serves as headquarters for distribution. Deliveries are made four times daily, 8:30 a. m., 10:30 a. m., 2:30 p. m., and 4:30 p. m.

THIS LICENSE IS NOT TRANSFERABLE

Motor Spirit obtained by this License may be used only for the purposes defined in Clause 3 of the Motor Spirit Restriction Order, No. 2, 1917.

Name and Address of Holder of License

J. A. Macble Esq.
Riveltoke
Bridge Lane
New 4
London

This License is issued on the condition that the license holder shall hold himself, or his paid driver, and his motor car or cars at the disposal of the military authorities for use in the event of a national emergency.

Date of Issue 3 NOV 1917

Number of License 42219

Sub-Number 40960

FULL-DUTY LICENSE
(FOR A MOTOR CAR)

60. Gallons of Motor Spirit, not more than 10 gallons to be obtained in any one calendar month

Issued under the provisions of Sections 19 and 20 of the Petrol Control Act, 1917, by

THE PETROL CONTROL DEPARTMENT OF THE BOARD OF TRADE,
19, Berkeley Street, London, W. 1.

This License is valid for the period from 1st November, 1917, to 30th April, 1918, and must be returned to the Petrol Control Department on or before 30th April, 1918.

1 (6)

Sub-number 40960

1 (4)

NOVEMBER, 1917.

2 Gallons.

2

VOUCHER FOR TWO GALLONS.

Supplied by

Signature of Licensee

Date Nov 5 1917

Signature of Supplier

Date Nov 5 1917

Supplied by

Date Nov 5 1917

Forms of license an English owner must have to run his car

One extra delivery, at 7 p. m., is made Saturday. Sunday the motor cars are idle. Thirty minutes before the delivery period, all the cars call at the various stores holding membership and pick up baskets and packages ready for delivery. These are taken to the central depot and sorted by wards. Each wagon has its own district and this avoids doubling over territory by different cars. It is possible to lessen the time that the goods leave the stores until ready to leave the depot. In several instances, the time has been as brief as 20 minutes.

Twenty-five of the leading business houses have joined the movement, and, as the economical results become demonstrated, it is believed every firm will become allied. Members of the firm charge patrons nothing for delivery if the order exceeds 50 cents. If less than that sum, a charge of 5 cents is made. If a special trip is desired, a fee of 10 cents is charged and the package is sent out immediately. Tags are sold to each merchant holding membership, and one of these is affixed to each package, showing the name and street number of the buyer. The tags are sold to the merchants by the thousand and serve to keep a record of the number of parcels handled and the share of the expense of operation.

Nine motor cars for the regular deliveries and two for the special deliveries were installed at the outset, and these will be added to from time to time as the business increases. It is estimated that the co-operative system will save each merchant 10 per cent of his overhead expense.

OVERLAND MOVES DOWNTOWN

Chicago, Dec. 22—Southward growth of Chicago's famous motor row on Michigan avenue, which is leading it away from the business part of the city, will be turned to the skyscraper section if other dealers follow the lead of the Overland branch. A downtown showroom is to be established at Washington and Michigan, right on the edge of the shopping district and at a point which will be of strategic importance when the new boulevard link is completed.

MANLEY NOW O'CONNELL-MANLEY

Waukegan, Ill., Dec. 24—The Manley Motor Corp. has been reorganized as the O'Connell-Manley Truck Co. William L. O'Connell, formerly Chicago commissioner of public works, and county treasurer, as well as chairman of the state public utilities commission under Governor Edward F. Dunne, becomes treasurer and Edwin Page, formerly treasurer, has been made vice-president. E. J. Manley and H. P. Manley retain their offices as president and secretary respectively.

The company will make a 1-ton truck to sell at \$1,400. Specifications include a 3½ by 5 engine, Dyneto starting and lighting and Delco ignition. Gasoline only will be used as whereas gasoline and kerosene are used in the other Manley models. The 2 and 2½-ton models will be continued and a 3½-tonner substituted for the 3-ton. Three sizes of tractors of semi-trailer type will be built. A 3-ton will operate on gasoline only and 5 and 7-ton models on gasoline and kerosene. In all 100,000 sq. ft. of floor space will be occupied.

Shows Set Special Days Every Soldier, Sailor and Engineer to Have His Date— Society Not Forgot

N. A. C. C. Calls Meeting on Motor Trucks

NEW YORK, Dec. 24—Tuesday, Jan. 8, will be Army and Navy day at the national show which opens the 5th in Grand Central Palace. All soldiers and sailors in uniform will be admitted as guests on that day and in addition will not be required to pay the war tax. Though there will be no war products at New York or Chicago there will be a decided war atmosphere at the Palace. Many exhibitors are to display service flags not more than 2 by 3 ft., and in addition the decorations will be patriotic.

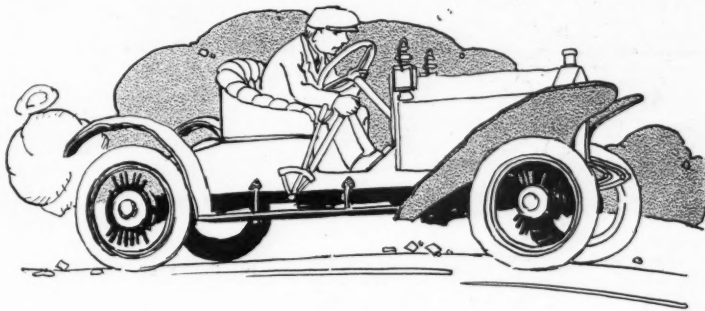
Following the custom of former years there will be a society day, Jan. 9. Thursday, Jan. 10, will be S. A. E. day. Already show cars are beginning to arrive in New York, and these are being stored in the

service stations of the New York dealers representing factories.

As to the decorations, shields representing "The Flame of Liberty" upholding the flags of the Allied nations will be used to decorate the pillars on the main floor of the Palace. The lattice work and plaster cast of former years have been discarded, and mural paintings will be used throughout the four floors to resemble tapestry hangings. On the main floor the windows will be decorated by specially made curtain effects of tapestry painted in the designs of the standards of the Allied nations. The general scheme will be that of an old castle.

All manufacturers of motor trucks are invited to attend a general convention to be held in the board room of the National Automobile Chamber of Commerce here at 10 a. m., Jan. 8, during the show. The purpose of the convention is service to the Government through co-operating with its motor truck program, and assisting to relieve the railroad congestion by the use of motor trucks and service to the motor truck industry so that manufacturers may better understand the demands to be made upon them and be better prepared to meet them.

Papers will be read by men prominent in the industry and in the Government.



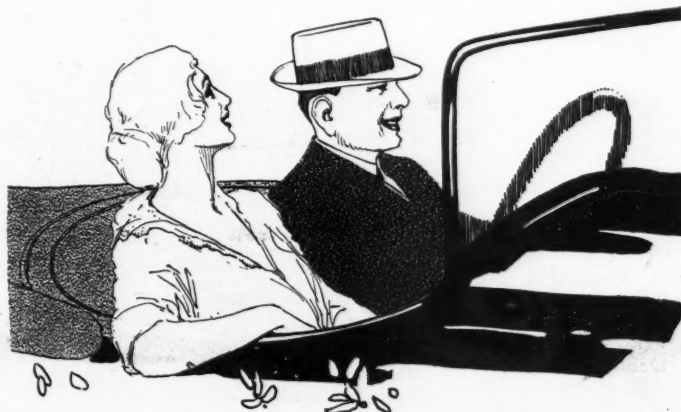
TO AN ANCIENT CAR

The car is old and tries to queer me;
It stalls and the goad is never near me;
Its lungs still cling to the rust-ridden frame,
But every breath brings me deeper shame,
For the car is old and weary.

Its heart is old and black with carbon;
It misses when I put my best garb on;
Its gears are stripped and its bearings are punk,
I'm stuck with a flivver that's mostly junk.
Are all cars as old and picked on?

Buck up, old cart! and cease back-firing;
There are miles in you yet, miles for hiring;
Your pep is gone, your gas is low,
Into each tank some rain must blow.
Some cars must be old and tiring.

—R. C. Willoughby.



Class A Trucks Ready to Go



Note the front bumpers. They are of wood supported on two massive springs mounted on brackets attached to side members of the chassis



Rear view of class A truck, showing massive construction of the bumper at the rear ends. Final drive is by internal gear. In the other most important respect the class A and B trucks are similar



B. B. Bachman, chief engineer of Autocar, and Lieut. K. E. Battey, Government inspector of the Autocar job

These views are of the class A trucks assembled at the Autocar plant. The first was assembled at the Denby truck plant



Warming the Engine Overnight

Underhood Types of Heaters That Are Making Starting Easier After a Night in the Garage

By B. M. Ikert

Motor Age Editorial Staff

If you have not installed a heater in your garage you can do the next best thing—buy an underhood type heater to keep the engine warm overnight, so it will start on the first few turns of the crank or starter. Motorists who use their cars all winter but house them in an unheated garage know what a difficult thing it is to get the engine started in the morning. Gasoline does not vaporize readily, the engine is stiff, owing to congealed oil, and much valuable current taken from the battery in a vain attempt to get the engine to fire. All of this can be avoided, if such parts as the carbureter, intake manifold, waterjackets, etc., can be kept at a moderate temperature overnight.

Keep Parts Warm

This is precisely what the underhood type heaters are for. They afford enough heat to keep the parts under the hood warm and in some cases enough heat is given off to warm the interior of the garage considerably, providing the latter is not too large, or has leaky windows and doors. Some of the heaters are electric, in which case a plug is furnished, intended to screw into an ordinary light socket. Others are of the hot water type, whereby hot water is kept circulating in the water jackets of the engine.

When the nights become more moderate the heater need not be set going, but can be turned on for a short while in the morning, while the owner is eating his breakfast. Then when he is ready to drive to the office, he finds his engine and carbureter in shape for a quick start. If you have a radiator and hood cover keep the front flap down and see that the hood is down tight when the heater is in use. This will retain the heat under the hood, where it does the most good. Following is a description of what the market affords in the underhood heaters:

Presto—The Presto electric heater operates from a 110-volt alternating- or direct-

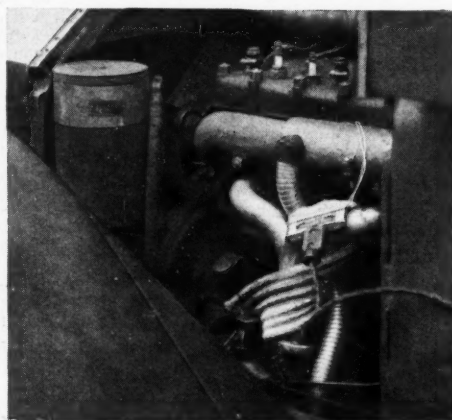
current line and comes complete with 10 ft. of cord and attachment plug ready for use. All the user has to do is to screw the plug into the nearest light socket, put the heater under the hood close to the engine,



Presto heater, showing operation



Hughes electric heater for under hood



Despatch heating device, above, showing it in operation below

carbureter or radiator. When he goes to the garage in the morning, he finds his engine warm and in a good starting mood. The heater itself is 11½ in. long, 3¼ in. wide and 1½ in. thick. It is equipped with a handle at one end and a hook at the other. The handle makes it possible to handle the heater conveniently while still hot and the hook operates on a swivel base, allowing the heater to be hung in practically any position under the hood. Naturally an electric heater gives off a uniform heat and as there is no flame connected with its operation, the fire risk is eliminated. Price, \$4.—Metal Specialties Mfg. Co., Chicago.

Cylindrical in Shape

Hughes—This is an electric heater in which the heating element is cylindrical in shape. Like other electric heaters it is provided with a suitable length of cord to attach to a light socket and it is stated that the cost of operation is less than 1 cent per hour on the average lighting rate, when using the standard 100-Watt size and proportional for the larger size, where the weather is extreme. In operation there is a steady flow of heat issuing out of the holes in the jacket, which is capped with nickel-plated ends. Price, \$5.—Hughes Electric Heating Co., Chicago.

Consolidated—This electric heater consists of a rust-proof coil wound on heavy porcelain rigidly supported by large molded insulators at both ends. The heating element is protected by a substantial perforated steel case. It costs about 1 cent an hour to operate, it is said, and consumes 200 Watts at 110 volts. Either direct- or alternating-current is suitable. Six feet of lamp cord and attachment plug is furnished. In use the heater is simply placed under the hood right on the engine and in this position enough heat is given off to warm the water jackets, carbureter and other necessary parts. Price, \$3.75.—Consolidated Car-Heating Co., Albany, N. Y.

Despatch—One of the features of the Despatch electric heater is its flexibility. It is designed to heat the carbureter and intake manifold by wrapping the heater around those parts. It is used in the manner illustrated and after the current is turned on and allowed to flow for 10 or 15 min. the engine is in shape to start readily, even on a very cold day, it is stated. The heater is furnished to operate on either 110 or 220 volts, the current consumption being small, only 300 Watts or less than 3 amp. at 110 volts. The pad or heating element is 16 in. long, 3½ in. wide and ½ in. thick. Price, \$7.—Despatch Mfg. Co., Minneapolis, Minn.

Underhood—This is a hot-water system for motor cars and operates from an individual gasoline burner. It may be attached to any car and takes the water from the base of the radiator, heats it, passes it through the water jackets and if

(Continued on page 33)

Effect of Public on Sales of Cars

Design Based on Demands of Buyers with Scientific and Efficient Engineering to Make Ultimate Car Better

PUBLIC demands are the ultimate factors in the sales of the car, and the closer engineering design dovetails with the demands of the public and at the same time coincides with what is really scientific and efficient from an engineering standpoint the better the ultimate car will be—this is the conclusion of the paper on "What the Automobile User Is Demanding of the Automobile Manufacturer" presented by J. Edward Schipper, technical editor of *Automotive Industries*, to the Cleveland section of the Society of Automotive Engineers Friday night.

The discussion included the subject of convertible bodies, the members arguing as to the relative advantages of the fixed and removable-pillar types. It seemed to be the consensus that the fixed-pillar will be the dominant type. There was no contradiction of the speaker's assertion that car weight per passenger in this country is too high. It also was conceded that the performance desired by the American user could be obtained from an engine of 200 cu. in. piston displacement with a car weight of 3 lb. per pound of passenger weight.

Kerosene Non-freeze Agent

Mr. Schipper brought up the question of kerosene as a non-freeze agent, pointing out that if \$2 in alcohol could be saved for each owner in the winter belt, a net saving of \$2,000,000 would be effected. He also stated that factories are using it in their test cars with success on pump-cooled cars and also on thermo-syphon cars with tubular radiators. He thought that the pressure head on a thermo-syphon system is so low that it may not be advisable to try it with a thermo-syphon system having a cellular radiator on account of the high viscosity of the kerosene which would give considerable resistance in forcing the kerosene through the radiator. It also was pointed out that the systems must be kept full, that it must not be used in temperatures more than 20 above zero and that the temperature registering devices used on radiator caps do not work satisfactorily with it. Three members cited examples where kerosene had been used satisfactorily. The paper follows:

The war is like a gigantic metal whirlpool into which metals are drawn from all over the world to find their way into the guns and into the thousands of other war instruments which are necessary in the carrying out of a modern battle. Many of these metals and many of the other materials used in the construction of motor cars are used at the front, and many of the other metals and other materials which are used in the motor car are necessary to the factory which is making munitions for the front, and so the question of materials becomes one of prime importance in the motor car of today.

This may seem like a matter which is entirely up to the car manufacturer, and yet it has as much to do with the consumer as with the maker of the car. In spite of the fact that cars are increasing in price almost from month to month, the demands of the user for performance are also increasing from month to month. While the average price of cars has gone up several hundred dollars, if we leave

out of consideration for the moment the very lowest-priced cars, the average price that the user wants to pay has not gone up nearly as much as the price, and therefore we see performance, which was formerly expected only in the higher-priced cars, demanded as a matter of course from cars which at the present time do not cost nearly as much.

No one knows better than the manufacturer that the car buyer wants performance. The carburetor manufacturer is familiar with the same thing. He knows that the public is demanding that he produce an instrument which is capable of throttling to speeds hardly in excess of 2 m.p.h. and upon application of the throttle of picking up rapidly and surely to speeds in excess of 50 m.p.h. on fuels which are forever going down in quality and volatility. What does the average user demand? He wants a car that does not cost him too much. In the first place; he wants a car which will be tied up in the service station for the minimum amount of time. It is a matter of pride with every user that his car is dependable, and it is a matter of necessity with most users that the car will be able to perform more than 300 days a year without a falter. If we took an average of all the users in the country, we would probably find that there is a demand for 15 m.p.g. of gasoline; that there is a demand for quick acceleration, good hill climbing, easy gear shifting, comfort in the seats and springs, accessibility for small adjustments and repairs, a minimum, or rather an absence, of rattle, and when it comes to tires, anything short of 8000 miles is always occasion for a fit of peevishness.

Torque-weight ratio is the governing factor in acceleration and hill climbing, the two greatest demands made by car buyers in this country. The demand for reserve torque probably will exist for years to come, and the value of horsepower is something which has been greatly exaggerated by literature of engine and car manufacturers. The words "high power" are fascinating to the layman's mind, and he has been led to believe that if he has a powerplant capable of a high maximum output under his hood, he has an engine which will enable him to run away from other cars with a powerplant not capable of developing such high output. This, of course, in the face of real analysis is untrue, because the high horsepower may not be reached until such a high number of revolutions per minute that the car speed would be prohibitive under ordinary gear ratio conditions.

All the performance desired in a five-passenger car can be secured with an engine under 200-cu. in. piston displacement. All the acceleration wanted and all the hill-climbing ability would be incorporated in such a car. The ratio of engine torque to weight could be made very high in such a car at the speed at which such a ratio is most desired, and if an engineer were told to get out a five-passenger car in which all the performance demanded is incorporated, with an economic use of materials and an economic maintenance factor maintained, he would be wrong to go much above the 200-cu. in. limit. The idea that a perfect-riding car is one of infinite weight should not be the goal.

Weight of car per pound of passenger weight is too high in America. The tendency toward long wheelbase and big engines is responsible. A five-passenger car should not weigh more than 3 lb. per pound of passenger weight if it is to be considered a truly economical design. With a designed load of 750 lb., a 2250-lb. car would be about right.

If this economy in material and maintenance were carried out there would be much less talk regarding material shortages, and this vital means of transportation would not be threatened to be put in the class of non-essential industries.

Winter is now upon us, and to the list of requirements given above must be added that of starting rapidly on a cold morning. Since this is the most pertinent point of all at the present time, we will touch upon this first. All the

hot spot intakes and exhaust-jacketed carbureters in the world will not do one thing towards making the car easier to start. The carburetor manufacturers have provided us with very efficient chokes; even at the speed attained by the average starting motor on a cold morning these chokes are capable of shooting into the cylinders a supply of raw gasoline which would go a long ways in operating a dry-cleaning establishment. Sometimes some of this raw liquid is ignited during the first 3 or 4 min. of cranking, but quite often the motorist helps the situation along by distributing ½ pt. more of gasoline between the four, six, eight or twelve cylinders. This joins the supply which the efficient choke has put into the combustion space, and ignition starts only, however, after a liberal supply of the raw fuel has leaked its way past the piston rings and gone down into the crankcase to help form what is sometimes called crankcase soup.

If the car starts in 30 sec. the user is fairly well satisfied. He does not think, however, of all the gasoline that can be drawn into the cylinders and leak past the piston rings in the space of 30 sec.; he does not consider the fact that his lubricating film has been destroyed to a large extent by this gasoline, and he does not stop to consider how much the supply of lubricant in the crankcase has been deteriorated due to dilution of the oil by the heavier constituents of the gasoline.

Cold Starting Solution

In these days when high prices of labor and material are forcing the price of cars upward, something must be done to meet the cold starting situation. A heating coil in the float chamber, or some other gasoline chamber, a water heating system connected with the radiator, or some other method which is equally effective, must protect the owner from the consequences of crankcase dilution. The average owner is wise enough to know that it is requiring a pint or more of gasoline for him to get his engine warmed up on a cold morning. He knows that he is not burning this pint of gasoline and all of it is not going out of the exhaust; therefore, the remainder forces its way into the crankcase, and cars which are fitted to combat this trouble are going to have a strong selling argument and are going to go a long ways toward meeting one of the biggest demands made by car users on the car manufacturer.

The heated intake has been studied so carefully by all manufacturers that it is useless to dwell upon it. Only one suggestion should be made, and that is that there are a great many manifolds which are erring on the side of too much heat rather than too little. It is practically impossible to meet the extreme range of temperature conditions, which range amounts to 100 deg. or more in most of the cities along our temperate belt without some sort of adjustment. The air always is preheated to some extent and probably the means of adjustment to meet the outside temperature conditions is effected most rapidly by varying the amount of heat which is imparted to the initial air before it enters the carburetor. Too much heat makes the engine unsatisfactory, due of course to its reduction in volumetric efficiency, but the proper amount of heat, in spite of the expansion of the intake gases, often will result in an improved torque curve.

There is no Herbert Hoover controlling the gasoline situation in this country, but it might be due to his influence that the habits of economy are being instilled into the minds of the Americans more than ever before. It is a noticeable fact that this year's car users are demanding gasoline economy more than ever, and vigorous activities can be noted on the part of carburetor manufacturers to supply this demand.

The carburetor, however, is not the only factor in economy. Lightness, which has always been important from a performance standpoint as well as that of economy, is a paramount necessity. Lightness does not only mean the reduction of weight by scientific design of parts,

but it is possible to gain a far greater amount of weight by a scientific use of wheelbase length. In this country we have been wasteful of wheelbase. We have secured a minimum of passenger space with a maximum length of car. It has been possible in Europe, due to the use of shorter engines, shorter hoods and the more scientific location of parts, to get much more room on a given length of car, with the result that the car weight per passenger has been very much reduced. Scientific designing from one end to the other would make possible a great economy in materials and yet a very little sacrifice in performance; in fact, there need be no sacrifice but an actual gain in the way the car operates.

It is a certain fact that the American public demands the appearance of great size in its cars. The largest car selling for a given price will carry large sales, simply due to its size. Coupled with this demand for size, the American public also demands acceleration. Size means weight and weight certainly operates against the quality of acceleration to such an extent that the torque requirements of the engine must be increased greatly to give the pick-up designed with the large car.

In Europe there are cars which, by a scientific use of the wheelbase, give all the necessary room at a greatly reduced weight, and consequently can supply all the acceleration demanded with an engine of greatly decreased developed horsepower. The fact that the car weight is less allows the engine bearings and all other parts to be reduced accordingly and at the same time have factors of safety which are largely those used in average American practice, giving a greater endurance and a smaller service factor than can be expected from the large, heavy, high-powered design which engineers have been forced into much against their will.

This is war time. It is a time for economy and efficiency; therefore, let us appeal for a car design which is efficient and economical. It is exactly what the public wants, but owing to the education which we have given them through unhappily worded advertisements and by other means, the public believes that its demands are met in proportion with the size of the car. Tire economy and miles per gallon of gasoline and other desirable requirements have been sacrificed because it is believed that acceleration and comfort in riding can be secured only with the car of long wheelbase. As a matter of fact, careful design, coupled with compactness in engine units, will allow several inches to be taken from the wheelbase of the car without any sacrifice of room, without a great loss in riding comfort, if any loss exists at all, and at the same time with a gain in materials, a saving in weight, tires, gasoline, space required for parking and in every direction which can be thought of. It costs less to

build a shorter car, and this money could either be taken from the price of the car, which would certainly be another factor in what the user is demanding, or it could be put in refining the design, with the result that probably even greater lightness would result and better upholstery, better painting, and better trimming could be applied which would tend to make the result a high-class car throughout.

For some reason or other high-priced cars in this country have nearly always been big cars due to the necessity for catering to the taste for size, and yet the very trend of public demand shows that exactly what it wants can be met in a medium-priced, small-size car which incorporates all the beauty of design to be found in the highest-priced products and all the excellent materials which are used in cars which to-day are only sold in long wheelbase.

This presents the picture from one side. We all know what the public demands because we know exactly what we like ourselves in a car. We like to step into a roomy, comfortable front compartment, into which we do not have to squeeze to seat ourselves behind the steering wheel. We always are pleased when our first glance tells us that the control members can be readily seen and readily reached. We want the engine to start almost on the first touch of the starting button; we like the starting pedal to engage with little effort, with the engine running smoothly and quietly; we want a clutch pedal which is depressed by very light touch of the foot and which when engaging gives a smooth pick-up without unnecessary slipping and without excessive grabbing.

Exterior appearance is a matter of choice, and like a great many things which are changed from season to season, it is impossible to lay down any rule as to what they should be like, without sharp breaks from radiator cap to the end of the tonneau. Another year this might be different. Nevertheless, the car should conform to the dictates of the moment. The upholstery should be good, and here it may be said that some of the latest of imitation leathers are rendering excellent service and are doing better in fact than poorer grades of genuine leather.

The top should be so designed that it is quickly put in place and the side curtains should permit of ready view on all sides of the car. Some of the side curtains, with their small lights, shutting off the view of the driver, are a positive menace in city driving rather than an advantage. The windshield should be drip-proof and have the ventilating feature which has come to be demanded by everyone. The public is demanding a good car and an economical car, and the engineer must supply by scientific design what the public demands in the face of the fact that he is now under limitations of material which did not hinder him a year ago.

ably during the last two years, and the present demand is far in excess of the supply. High prices and increased cost of upkeep of farm horses, added to the heavier expenses for labor, have compelled the larger farmers to turn to the tractor. A local farmers' association has stated that it would be difficult for any class of farmers other than those cultivating more than 160 acres to make use economically of tractors unless the smaller farmers can combine to use one tractor among several of them. It seems only a question of time until a hiring system will be found which will work conveniently and economically in much the same way as in threshing.

Several American tractors are on the Scottish market, in limited numbers on account of import restrictions, but experience has made the Scottish farmer confident in the American make of farm machinery and doubtless there will be a great demand for American tractors after the war.

CARS MAKE SOLDIERS HAPPY

Des Moines, Iowa, Dec. 22—Motor cars will be a big factor in bringing Christmas cheer to hundreds of homes in Iowa, Illinois and Minnesota this year which otherwise would have had to spend Christmas without their soldier boys. A week ago Camp Dodge, Des Moines, was overcome with gloom when it was announced that on orders from the War Department only such soldiers at Camp Dodge as could reach their homes over trolley lines would be given leave of absence for Christmas. This was to prevent overcrowding railroad facilities when troop movements are most important.

Then the parents and soldiers conspired to the end that the order was moderated to allow men leave who could reach home by motor car. As a result there was a great exodus of men yesterday. Eighty-five Minneapolis soldiers of the 337th Field Artillery and the 339 Machine Gun Battalion chartered twelve taxicabs to make the trip home and return. Keokuk, which is as far from Camp Dodge as any other town in Iowa, raised \$1,000 to send their soldiers as far as Ottumwa by taxicab, at which place they will be picked up by motor cars belonging to the home folks. Thirty-five Moline, Ill., soldiers also hired taxis. From the towns nearer Des Moines came hundreds of cars to take the soldiers to their homes, and scores of mothers and fathers will come to Camp Dodge in motor cars to spend the day with the men who did not secure leave of absence.

PHILIPPINE TRACTOR NEED GROWS

Manila, Dec. 1—Long continued ravages of rinderpest have reduced the number of carabao, the common beast of burden in the Philippines, and the continued expansion of agriculture in the island is creating a good demand for a light farm tractor to sell at a reasonable price. Purchases of heavy tractors which sell at high prices will be limited to a few of the larger haciendas, but the market for light tractors for small planters and co-operative groups will be general. So far no such tractor introduced into the islands has been satisfactory.

October Motor Exports Show Increase Gain 30 Per Cent as Compared to September

1917			
Mos.	Cars	Value	Trucks
Oct.	5,536	\$4,481,127	1,333
Sept.	4,077	3,645,280	1,251

1916			
Mos.	Cars	Value	Trucks
Oct.	4,880	\$3,756,768	1,144
Sept.	4,077	3,645,280	1,251

WASHINGTON, Dec. 14—Exports gained a little in October, increasing 30 per cent as compared to September. Passenger car shipments showed a gain of 35 per cent, but truck shipments increased only 6½ per cent. During the month 5536 passenger cars, valued at \$4,481,127, were shipped, which compares with 4077 cars, valued at \$3,645,280, during the previous month. On the other hand 1333 trucks, valued at \$4,374,470, were shipped, as compared with 1251, valued at \$3,675,717, in September.

There is little difference in the number of truck car shipments during October and the corresponding month of 1916. During the latter, 4880 passenger cars, valued at \$3,756,768, and 1144 commercial vehicles, valued at \$3,635,291, were shipped. The value of parts

exported in October, 1917, is 68 per cent greater than during the corresponding month of 1916.

Our biggest buyer is still the United Kingdom, although France is gaining rapidly. Great Britain's purchases, amounting to \$2,216,373 included 498 trucks valued at \$1,768,529 and 224 cars at \$448,844. French purchases totaled \$1,934,702, almost a million dollars more than October, 1916, and showed an increase of 110 per cent. Our largest buyer of passenger cars was Canada, which imported 1020 of this type valued at \$676,483. Argentina is second, with a record of 875 at a cost of \$525,226. The increase in the number of cars bought from the United States by South America is remarkable, Argentina and Chile together nearly doubling their account of October, 1916.

MORE SCOTTISH FARM TRACTORS

London, Nov. 15—The use of tractors in Scotland on farms has increased remark-

The Industry's Year in Brief

Continued from Page 11

duction of armored cars and tanks for Army with rank of major.



United States requisitions $\frac{3}{4}$ -ton Reos for Army.

Ford Motor Co. manufactures its 2,000,000th model T car.

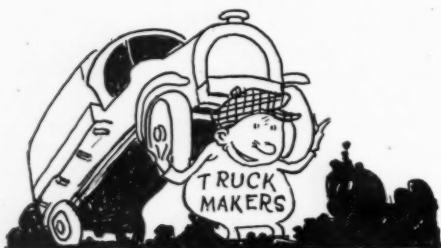
Oneida Motor Truck Co. organizes with capital of \$300,000.

Eighty-seven makers bid on first 35,-



000 trucks required by War Department, Pierce-Arrow, Hurlburt and Nash offering to make the entire 35,000.

Ford rushes 2400 ambulances for War



Department, the first order given to Detroit makers and involving \$1,500,000.

John N. Willys heads Curtiss, and huge airplane factory is built near Willys-Overland.

Nordyke & Marmon begin manufacture of airplanes for Government, adding to plant.

Boyd Motors Corp. organizes with capital of \$5,000,000 to make airplanes and motor car engines.

Willys-Overland breaks record by selling \$11,150,000 worth of cars in June, 1075 cars at retail June 25, worth \$988,200, new high water mark for single day's trade.

JULY

Quartermaster's Corps contracts for 10,650 chassis approved by chief of staff of Army.

Industrial inventory section of Council of National Defense starts taking

stock of automotive industries as to what can be expected from each plant and requirements of industry as to labor, machinery, etc., in war manufacture.

Packard gets order for 1800 3-ton trucks, involving \$5,000,000, 100 to be delivered in August and 500 a month thereafter.

Dealers and distributors from principal cities of United States organize National Automobile Dealers' Association founded on local association idea.

War Department lets contracts for 24,050 truck bodies.

Liberty aviation engine is announced ready for manufacture and use in great aircraft fleet almost simultaneously with signing of aircraft appropriation bill of \$640,000,000. Engine is composite of best in design of United States and



European engines with interchangeability of parts the chief feature.

Secretary of War approves appropriation to enable Quartermaster's Department to complete design of standard class A and class B trucks and to build and test experimental models.

War Department orders 5750 truck chassis additional to the 10,500 already ordered.

Shadburne Brothers Co. takes over Dixie Motor Car Co. and Bow-Davis Motor Car Co.

Airplane makers agree to cross-licensing of patents to any responsible manufacturer of airplanes, and Manufacturers' Aircraft Association is formed. All patent litigation in regard to air-



planes ceases automatically, and industry is free to expand.

Between 125 and 150 distributors of Nash Motors Co. contract for \$32,000,000 worth of passenger cars and \$10,000,000 worth of trucks at annual convention of sales organization.

AUGUST

Sales first six months for Chevrolet double those of first half of 1916 with 65,235 valued at \$29,704,773.

Willys-Overland July sales figure

\$13,611,775, an increase of \$2,500,000 over the high water mark established in June.

Henry Ford & Son incorporate to make Ford tractor with capital of \$1,000,000.

Willys-Overland interests gain control of Curtiss Aeroplane & Motors Co., making Curtiss airplane engines in large quantities. The same officials and board of directors serve for both, and stock of airplane company is held in voting trust.

Wright-Martin Co. and nine other airplane makers formally organize Manufacturers' Aircraft Association to settle all questions regarding airplane patents and to act as clearing house open to all bona fide makers of airplanes.

Net earnings of Standard Parts Co. for first six months total \$1,994,793.02.

Twenty-nine distributing companies are represented at three-day Nash convention and take more than \$37,900,000 worth of passenger cars and several million dollars' worth of trucks.

Four Wheel Tractor Co. reorganizes as Topp-Stewart Tractor Co. with capital of \$500,000.

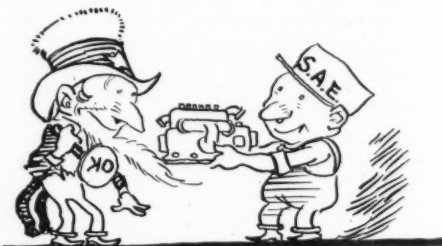
Six months Studebaker sales net just under \$3,000,000.

Willys-Overland in first six months earns \$6,000,000 with output for first half of 91,489 cars.

SEPTEMBER

Liberty aviation engine undergoes special tests and is approved.

Deficiency appropriation bill includes \$350,000 for transport of Army and supplies; \$3,000,000 for signal service;



\$12,000,000 for roads, etc., at camps; \$16,750,000 for armored cars, with authority to incur obligations not to exceed \$5,000,000 more; in addition to regular appropriation of \$640,000,000 for aviation. Bill also carries \$35,000,000 for Navy aviation.

Gramm-Bernstein and Selden are authorized to assemble two standardized military trucks for United States.

Lexington-Howard Co. reorganizes as Lexington Motor Co. with capital of \$1,800,000.

Amston Motor Car Corp. is incorporated with capital of \$3,000,000 and buys principal assets of Sterling Automobile Mfg. Co.

United States places orders for 1000 machine tools costing \$3,000,000 to be installed in plants that build Liberty engines.

Joseph R. Guffey, Pittsburgh oil man, is appointed supervisor of petrole-

um purchases for Army and Navy to aid in conserving supply.

Committee of automotive transport of Council of National Defense reorganizes as automotive products committee of Council with H. L. Horning chairman.

War Industries Board orders steel priority and fixes prices to expedite manufacture of airplanes, trucks, cars and parts.

Refinancing plan for Chalmers is ratified and by it Maxwell is to continue manufacture of Chalmers and to build Chalmers 3-ton trucks for commercial work in surplus space if Maxwell does not get United States orders for F-W-D trucks which are expected. Plant and assets of Chalmers are leased to Maxwell for five years.

OCTOBER

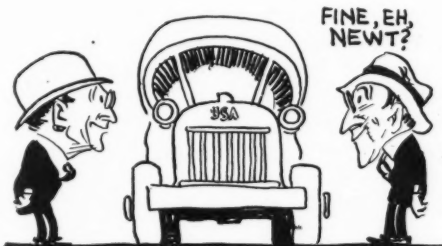
Maxwell net profits for fiscal year ending July 31, 1917, announced as \$5,368,546.

Members of Hudson Motor Car So. form Essex Motors Co. with capital of \$500,000.

Cleveland Motor Plow Co. reorganizes as the Cleveland Tractor Co. with a capital of \$6,000,000.

Standard Parts Co. acquires 100 per cent of American Ball Bearing Co. stock.

First two heavy-duty standard war trucks are assembled and started running three days before time set, Oct. 7, and travel overland to Capital, where



they are formally accepted for Government by Secretary of War. Trucks are composite design and represent the best in truck design with elimination of countless spare parts through standardization.

Willys-Overland announces car to sell at less than \$500 and to be produced in quantities.

Hydraulic Pressed Steel Co. buys Canton Sheet Steel Co. and plans to consolidate its interests, including Cleveland Welding & Mfg. Co.

Detroit Starter Co., maker of Genolite lighting systems and speederator, arranges with Ward Leonard to exchange patents, all subsequent systems to be equipped with Ward Leonard controllers.

Master Carburetor Corp. sells manufacturing rights of its carburetor to Master Carburetor Co. of Los Angeles, Cal., and new company is formed to sell primers, the Master Primer Co.

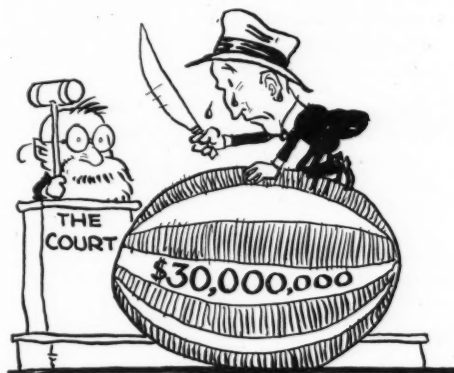
War Industries Board issues order to several steel companies making alloy steel such as used in motor cars not to make further shipments of alloy steel for manufacture of passenger cars for time



being; one steel maker protests and representatives of motor car and accessory makers rush to Capital to protest. Board meets with directors of N. A. C. C. and M. A. M. and agrees to have industry form special committee—later known as Automobile Industries Committee—to represent industry in all such matters before Board and also agrees to halt drastic action regarding steel until committee is formed.

NOVEMBER

Ford Motor Co. after long period of litigation loses suit brought by John F. and Horace E. Dodge and under decision



is ordered to distribute approximately \$30,000,000 in special dividends.

Bureau of Mines issues report contradicting rumors of gasoline shortage and proposed curtailment of motoring by restricting the use of gasoline in passenger cars.

Government commandeers 600 machine tools valued at \$10,000,000 and stored for export, through War Industries Board, the same to be used in the manufacture of airplane engines.

United States perfects class A truck and places orders for three experimental models with Autocar, White and Denby.

Orders for \$2,262,975 worth of Happy



Farmer tractors are placed at second annual convention held by LaCrosse Tractor Co.

Standard grade of gasoline for aviation decided on by representatives of United States and Allies, the new fuel to be developed by the Bureau of Standards and to be better than present motor car fuel.

Ford production reaches peak with 3000 cars made Nov. 20.

Wire Wheel Corp. of America licenses Dayton Wire Wheel Co. to make wire wheels under its patents for motorcycles, airplanes and Ford cars.

DECEMBER

Pathfinder car for Highways Transport Committee reaches Capital after testing roads and routes between Detroit and seaboard over which war trucks will travel to be shipped to Europe, coming over and from factories; 565-mile trip outlined.

Council of National Defense is reorganized, H. L. Horning with complete supervision of trucks, military tractors, motorcycles, engines and accessories, airplane parts, motor boats and gasoline engines, and through him these industries are to have full representation on the War Industries Board on all matters pertaining to priority and general production and purchases.

Scripps-Booth passes into the hands of the General Motors Corp.

Automobile Industries Committee gets 7000 complete gun-site assemblies, approximating \$3,000,000 worth of business, to be distributed to manufacturers.

Stegeman Motor Car Co. reorganizes as the Hercules Motor Truck Co., with a capital of \$100,000.

United States let contracts for 10,000 of the new class B trucks in lots of 500 and 1000, delivery to begin in January at a price estimated at between \$720 and \$800, the Government to supply all parts and pay transportation from the parts maker to assembling factory.

W. F. Durand, chairman National Advisory Committee for Aeronautics, states that mail and freight-carrying, location of vessels in distress, destroying of derelict vessels, mapping of United States and carrying passengers are some of the duties the Government proposes to put airplanes to after the war.

The Automobile Bumper Association, formed about a year ago by the principal manufacturers of bumpers, is dissolved by the consent of the manufacturers to a decree of the United States District Court for the Southern District of New York. The association was concerned with the pooling of patent rights and price regulation.

Detroit Starter Co. changes its name to the Versal Products Co. along with general expansion during which it increases its factory facilities more than 100 per cent.

Court orders Ford Motor Co. to distribute within thirty days a dividend of \$19,275,385, blocking River Rouge plan to establish extensive blast furnaces. Costs of suit are taxed against the individual defendants and not against the Ford company. Case is appealed to state supreme court.

Goodyear business for year shows an increase from \$63,000,000 to \$111,000,000 and net profits from \$7,003,330.09 to \$14,044,206.10, an increase of 74 per cent in business and 100 per cent in profits.

Peoria Tractor Co. reorganizes with capital stock of \$1,500,000 and plans to produce 2000 tractors a year.

Government lets contract for the first of several types of standardized trailers to the Grant Motor Car Corp. for assembly, a 1½-ton four-wheel reversible, or double-ended type. Trailer is the result of work of the quartermaster department in co-operation with the engineers of the leading trailer makers of the country.

Class A trucks assembled by Denby and White leave for Washington, to meet that assembled by Autocar enroute and arrive at Capital about Christmas.

Army train of thirty Packards, loaded with more than 100 tons of war material for use at the front in Europe, make trip from Detroit to seaboard as the first instance of putting into practice plans for utilizing the large quantities of trucks to be built in the West to transport munitions to the coast. Government breaks silence in regard to movements of army units, and journey is attended by patriotic demonstrations.

Magnetic Motors Corp. is formed as combination of Rauch & Lang-Baker Co. and Owen Magnetic Motor Car Co. of Chicago to act as distributor and as sales organization for new Deering-Magnetic car, which is to have a Dorris six-cylinder engine, the chassis, except for the Entz transmission, to be a Dorris product and to be fitted with bodies designed by Carl H. Martin.

Gross sales for Mason Tire & Rubber Co. for the year ending Oct. 31 were \$1,200,000, with total net profits of \$181,504.36.

U. S. A. adds class AA truck, a ¾-ton bevel-drive model for use by the quartermaster corps, Navy, marine corps, ordnance corps, bureau of docks, signal corps, medical corps and cantonment work in addition to any Government work requiring a ¾-ton vehicle and even for an officer's car with a passenger body. Five to be assembled as test jobs by Reo, Federal, Maxwell, Willys-Overland and at Washington, the last as a test against the quartermaster corps drawings.

Capital Increases

Dixie Motor Co., from \$150,000 to \$400,000.

Elkhart Carriage & Motor Car Co., from \$100,000 to \$300,000.

Portage Rubber Co., from \$125,000 to \$250,000 first and then to \$10,000,000.

Falls Rubber Co., from \$300,000 to \$500,000.

Schacht Motor Truck Co., from \$35,000 to \$100,000.

Lamson Truck & Tractor Co., from \$100,000 to \$500,000.

Gier Pressed Steel Co., from \$500,000 to \$1,000,000.

Columbia Motor Truck & Trailer Co., from \$35,000 to \$100,000.

Standard Steel Tube Co., from \$150,000 to \$600,000.

Pennsylvania Rubber Co., from \$75,000 to \$300,000.

Marathon Tire & Rubber Co., from \$500,000 to \$1,000,000.

Oakes Co., from \$250,000 to \$450,000.

Prest-O-Lite Co., to \$1,000,000, in January.

Necrology

JANUARY

F. E. Enger, president Enger Motor Car Co., Cincinnati, Ohio, associate editor of the American Motorist and manager Washington touring bureau of the American Automobile Association.

Amidee Bollee, Sr., inventor, brother of Leon Bollee, father of the motor car in France, who built a steam car first operated in 1873.

FEBRUARY

Giovanni Marsaglia, racer and engineer, killed while making trial flight as passenger on Italian army plane, Feb. 4.

H. D. Hutcheson, district sales manager for Lexington, killed in motor car accident.

MARCH

Clinton A. Hamilton, Chicago general agent for Allen, formerly general manager of Brown Corliss Engine Co., later president of Racine Mfg. Co., March 12.

J. M. Studebaker, Sr., founder of Studebaker Corp., March 17.

MAY

G. N. Thurber, vice-president Isotta Fraschini Motors Co.

Francis Cornelius Van Dyk, president Rutherford Rubber Co., maker of Sterling tire, May 21.

W. H. Turner, race driver and district salesman for Maxwell at time of death.

JUNE

Max Holtz, president Associated Blue Books Publishing Co., publisher of Motor Life, Automobile Blue Books and Automobile Trade Directory, June 19.

Conrad Mason, race driver, killed at Tacoma July 5.

SEPTEMBER

E. G. Westlake, pioneer writer of motor car news, Chicago, Sept. 19.

Russell Dale, sales manager Rich Tool Co., Chicago, Sept. 22.

OCTOBER

James Alexander, treasurer Guaranty Securities Corp., New York.

George W. Houk, pioneer in wire wheel business.

NOVEMBER

Samuel K. Pittman, assistant treasurer Willys-Overland, Nov. 9.

Alex A. Strom, president U. S. Ball Bearings Co., Chicago, Nov. 29.

FORD MAY BUILD SHIPS

Washington, Dec. 24—Special telegram—Henry Ford has been given full permission by the shipping board to inspect conditions of transportation, fuel and labor in the South with a view to building plants to turn out standardized ships at the rate of six or seven a day, using an assembly plan such as now is used in the motor car plants. Government money and resources will be given to Ford if he thinks well of the plan after his trip of investigation. The plan includes numerous factories making separate parts and shipping to main assembly plants to be assembled on hulls.

Ben Hur Motor Co., from \$1,000,000 to \$6,000,000.

Dort Motor Car Co., from \$500,000 to \$1,000,000.

Limousine Top Co., from \$30,000 to \$100,000.

Olympian Motor Co., from \$1,000,000 to \$2,000,000.

Federal Motor Truck Co., from \$500,000 to \$2,000,000.

Wisconsin Motor Mfg. Co., from \$350,000 to \$1,000,000.

Evinrude Motor Co., from \$350,000 to \$600,000.

Dorris Motor Car Co., from \$300,000 to \$1,000,000.

Firestone Tire & Rubber Co., to \$10,000,000.

Hoosier Sub-Carburetor Co., from \$10,000 to \$25,000.

Gordon Rubber Co., from \$600,000 to \$1,600,000.

Goodyear Rubber Co., from \$44,200,000 to \$53,570,000.

Monroe Motor Co., from \$1,000,000 to \$2,000,000.

Bijur Motor Lighting Co., from \$650,000 to \$2,000,000.

Mason Tire & Rubber Co., from \$1,000,000 to \$3,000,000.

Krebs Commercial Car Co., from \$100,000 to \$500,000.

BeSaw Tire & Rubber Co., from \$220,000 to \$1,000,000.

Finley Robertson Porter Co., Inc., from \$100,000 to \$250,000.

J. C. Wilson Co., to \$1,000,000.

Springfield Body Corp., to \$3,250,000.

Jones Motor Car Co., from \$500,000 to \$2,500,000.

Dodge Brothers, from \$6,000,000 to \$10,000,000.

E. G. Staude Mfg. Co., from \$150,000 to \$5,000,000.

Mergers

Economy Motor Co. and Bellefontaine Automobile Co.

Batavia Rubber Co. and Simplex Rubber Co.

Port Huron Construction Co. and Monroe Motor Car Co., as Monroe Motor Car Co.

Duesenberg Motor Co. and Loew-Victor Engine Co., as Duesenberg Motor Corp. with capital of \$1,500,000.

Krebs Commercial Car Co., Clyde Cars Co. and Lincoln Motor Truck Co., as Clyde Cars Co. with capital of \$500,000.

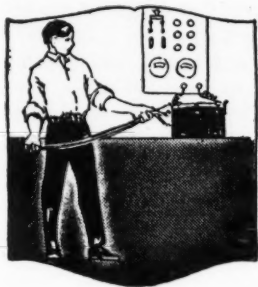
Permalite Corp. and W. L. Battery Co., as Permalite Storage Battery Co., Inc.

Bull Tractor Co., Whitman Agricultural Co., and Toro Motor Co., as Whitman-Bull Tractor Co. with capital of \$1,250,000.

Republic Rubber Co. and Knight Tire & Rubber Co. with capital of \$20,000,000.

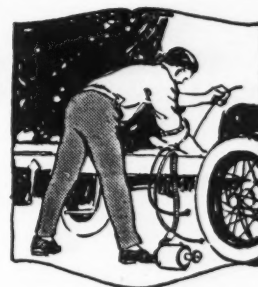
Grant Motor Car Corp. and Denneen Motor Truck Co., as Grant Motor Car Corp.

Prest-O-Lite Co., National Carbon Co., Union Carbide Co. and Linde Air Products Co. with a capital of no par value but estimated at \$228,000,000, according to market value of Carbon.



Electrical Equipment of the Motor Car

By David Penn Moreton & Darwin S. Hatch.



Editor's Note—Herewith is presented the seventy-fifth installment of a weekly series of articles begun in MOTOR AGE issue of June 29, 1916, designed to give the motorist the knowledge necessary to enable him to care for and repair any and all of the electrical features of his car, no matter what make or model it may be. At the conclusion of this series, "Electrical Equipment of the Motor Car," with additions, will be published in book form by the U. P. C. Book Co., Inc., New York, in a size to fit the pocket conveniently.

The fundamentals of electrical circuits of the motor car were explained through their analogy to water systems, and the relations of current pressure and resistance were brought out. This was followed by an explanation of series and multiple circuits, how electricity is made to do work in lighting, starting, signalling, etc. Calculating the capacity of a battery for starting and lighting and the cost of charging storage batteries and determining the torque a starting motor must develop were explained. Action of primary batteries and dry cells was considered. A section was devoted to the makeup and action of lead and Edison storage batteries, and another to the care of lead batteries in service and the best methods of charging them. Magnets and electromagnetism then were considered, and the principles of generators and motors explained. A section on generator output was followed by one on the purpose and operation of the cutout. Electric motors and engine and motor connections then were considered. Ignition was taken up next.

Part LXXV—Accessories—Woods Dual Power—Entz Transmission

IN starting all gears are in neutral and the first thing to do is to press the first-speed selector switch which connects one of the solenoids to the master switch. Next depressing the clutch pedal all the way down rotates the lever K, see Fig. 413, through the connecting rod L which is attached to the clutch pedal. This operation pulls the blades of the master switch M into contact which completes the circuit and energizes the first speed solenoid. As the gears are engaging and while the sliding member is within about $\frac{1}{2}$ inch of being at the end of its movement, the pawl G,

see Fig. 414, falls back due to the pull of the magnet against the trigger N, which is attached to the switch operating pawl L. The pawl L, due to this action, is made to raise out of engagement with the stem of the master switch and the switch opens instantly due to the action of the spring O. The time of this operation during which current is drawn from the battery is in the neighborhood of one-third of a second.

Wiring of Gearshift

A complete wiring diagram of the electric gearshift is shown in Fig. 417. A single wire leads from each solenoid through the terminal block to its particular button, while the other terminal of all the coils are connected to a common terminal thence to the master switch and battery. The remaining terminal of the battery is connected to a common bus beneath the selector switches. The connectors at the terminal block are considerably simplified by making each terminal a different size so that the wires can be replaced only on the terminals where they belong.

The following are some of the most likely causes of trouble in the operation of the electric gearshift:

First, exhausted or too weak a storage battery.

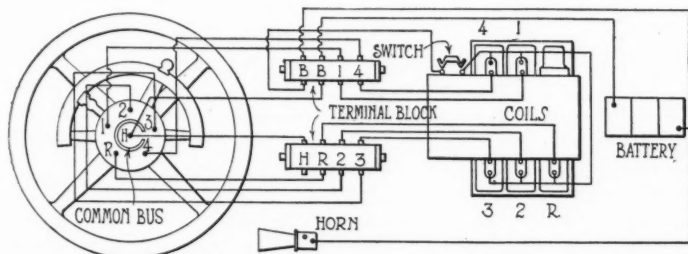
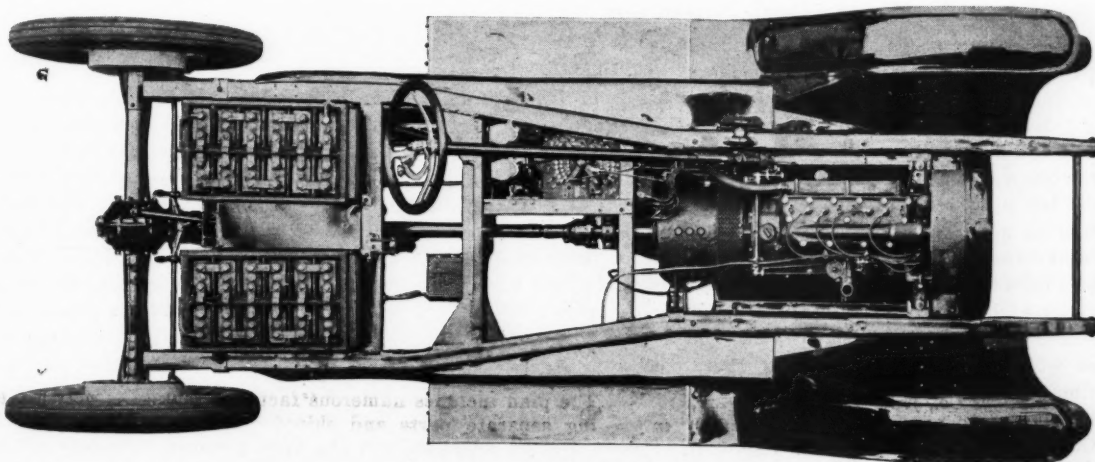


Fig. 417—Complete wiring diagram of electric gearshift

Fig. 418—Plan view of powerplant of Woods' Dual Power motor car which is a combination gasoline and electric



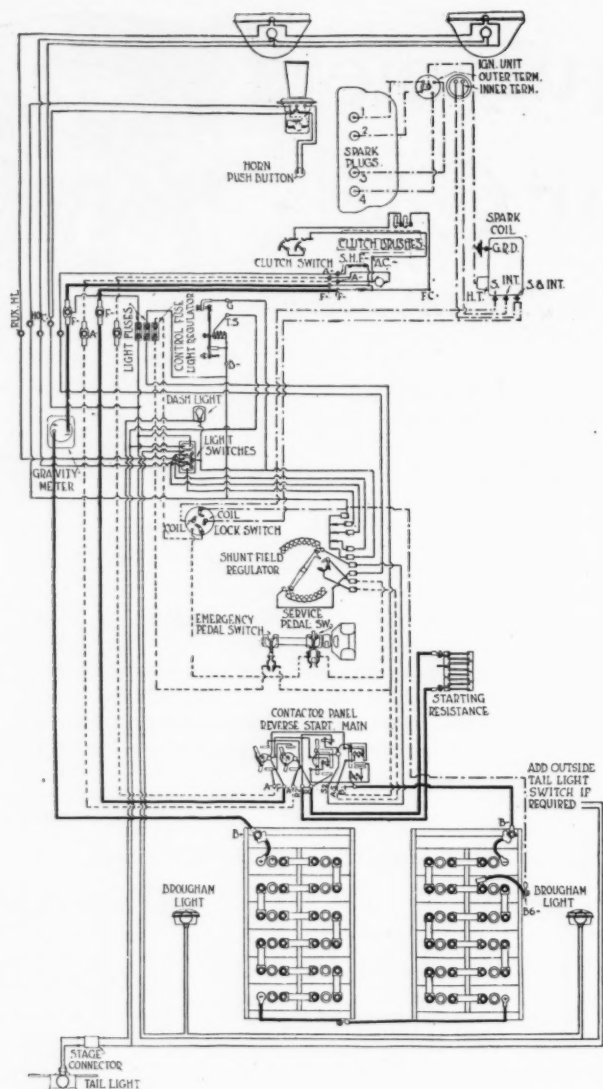


Fig. 419—Wiring diagram of Woods dual power car

Second, a break in the link connecting L to the clutch pedal.

Third, dirt in the master switch contacts or wear of same, thus preventing contact.

Fourth, failure of the spring O, which closes the master switch.

Fifth, loose connections due to vibration at the terminal block or selector switches.

Sixth, jamming of solenoid cores in the brass tubes due to the shaft getting out of alignment. This may be tested by using the emergency hand lever to see if the gears shift easily.

Seventh, broken connections in the wires or windings, which are not very likely to occur on account of the excellent protection.

Woods Dual Power Car

Motor cars propelled by a combination gasoline and electric powerplant are called dual power cars. The possibilities in the arrangement of the control of a car of this kind are very great, yet the control must be as simple as the ordinary gasoline car and at the same time allow the driver to use both the engine and the electric powerplant to the best advantage under all conditions of driving. Some of the advantages of the dual power system will be apparent after reading the description of the operation of the engine and motor combination. One of the best examples of a car of this type is found on the Woods dual power car, manufactured by the Woods Motor Co., Chicago.

The powerplant of the Woods dual power car, a plan view of which is shown in Fig. 418, consists of a four-cylinder Continental $2\frac{3}{4}$ in. gasoline engine, a magnetic clutch of Cutler-Hammer make, a compound-wound dynamotor manufactured by the General Electric Co. and rated at 48 volts and 60 amperes

and a special Exide storage battery of 24 cells having a capacity of 115 ampere-hours based on a 5-hour discharge rate. Ignition is by the Atwater-Kent K2 system, with automatic timing control. The small current for ignition is taken from the three end cells of one tray of the battery. The ignition current is turned on and off by a lock switch on the steering post.

The engine, clutch and dynamotor are combined into a single unit from which the power is transmitted direct to the rear axle without passing through a variable gear. A Baush undermounted worm gear is used in the rear axle, having a reduction of 8.25 to 1.

The magnetic clutch is of the plate variety and is combined with the flywheel. A coil is set into a recess cut in the flywheel rim, and when this coil is undersized the clutch plate is drawn against the flywheel rim by the magnetic force produced by the current. The clutch plate is faced with asbestos fabric, and the clutch cannot be seriously injured by slipping.

The dynamotor is of the compound-wound type and its motor characteristics are somewhat different from the characteristics of the motors found in the ordinary electric vehicle or when the car is being driven by the gasoline engine alone, when the clutch current is taken direct from the armature of the dynamotor. The dynamotor is used in starting the car just as an ordinary clutch is started, when the engine is at rest.

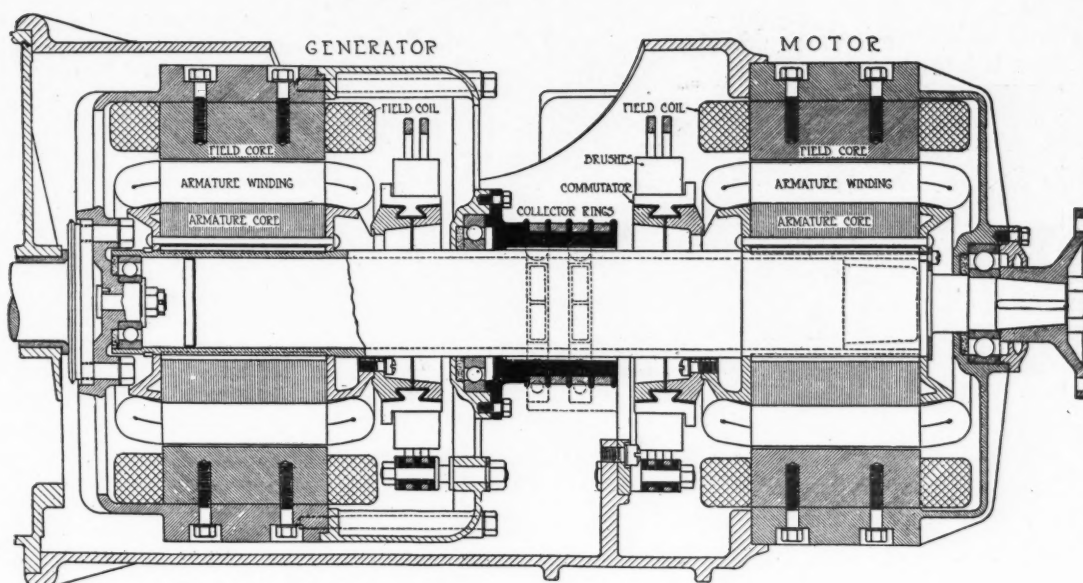
The starting controller, or the control panel as it is called, and the reversing switch are located under the driver's seat and there is a shunt field control rheostat under this foot board. There are two finger levers on the steering wheel. The outer of these two levers controls the field rheostat, and when this lever is at the top of the wheel, all the field resistance is in circuit. The inner finger lever controls the clutch circuit and the throttle. When the car is standing and the engine is idle, both finger levers are near the bottom of the sector on the steering wheel, and moving these levers forward or up has the effect, while the car is in operation, of increasing the speed, and in this respect the control is similar to the gasoline car. The first slight movement of the inner finger lever opens the throttle of the gasoline engine, and continued movement of this same lever closes the circuit of the magnetic clutch, which operates on full battery voltage, except when the car is being reversed, when the clutch is free or when the car is being driven by the gasoline engine alone, when the clutch current is taken direct from the armature of the dynamotor. The throttle continues to open as the lever is moved upward until the top-notch position of the lever is reached.

The main switch on the control panel, which connects the dynamotor to the battery, is not operated directly or mechanically by the driver but through the medium of a solenoid. For the sake of absolute safety, so that the power can be shut off under all circumstances, there are three brakes in the circuit of the solenoid. In starting the car this circuit is closed by the first motion of the outer finger lever, which acts on the specially designed switch on top of the field rheostat under the footboard. Another switch in the solenoid circuit is connected with the right-hand pedal pad and normally is closed but may be opened by pressing on the heel piece of the pad. The circuit also is controlled by the lock switch on the steering column, which also controls the ignition circuit.

Starting Resistance Cut-Out

In addition to the main switch for connecting the dynamotor to the battery, there is a secondary switch located under the main switch. The purpose of this secondary switch is to short-circuit the starting resistance when the current drawn from the battery by the dynamotor, which is operating as a motor, has dropped down to about 175 amperes. This operation of the secondary switch is accomplished by a differential electromagnet. The switch is held open by a series winding through which the main current of the dynamotor passes and is closed by a shunt winding. At the moment of starting from rest, the motor draws a very heavy current from the storage battery, which may amount to as much as 400 amperes. This very large current makes the series winding very powerful and the secondary switch is held in the open position, although the shunt winding tends to close

Fig. 420—Cross-section of the complete Entz magnetic transmission



it. As the current taken by the motor decreases in value the magnetic action of the shunt winding finally overpowers the series winding and the secondary switch closes, cutting out the starting resistance.

The balance in the series and shunt windings and the amount of starting resistance have been adjusted for the best operation under driving conditions ordinarily met. To provide more power under very adverse conditions, as, for example, in starting in sand or mud, on a hill, etc., a kick-in button is placed directly behind the driver's right heel. The kick-in button closes the secondary switch instantly, without waiting for the automatic action, and provides greater torque at the rear wheels than well could be used normally.

Adjacent to the main and secondary switches is a reversing switch by which the armature leads of the dynamotor are reversed to permit backing the car by electric power only. There is an interlocking mechanism between the right-hand control pedal and the reverse switch, so arranged that the reversing switch cannot be operated unless the right-hand control pedal is pressed forward until the brake is applied. Therefore, to reverse, the right-hand pedal is first pushed forward, then the reverse lever is depressed with the left foot, and then the right-hand pedal is allowed to come back, whereupon the car starts to move slowly backward, depending, of course, upon the position of the outer finger controlling the field rheostat.

The pedal on the left is an emergency pedal and serves to open the main switch solenoid circuit, the ignition circuit and the armature circuit in the reverse switch and to apply the mechanical brake. This pedal, like the right-hand one, is provided with a swiveled pad, which in this instance is used to operate a ratchet to set the mechanical brake. A complete wiring diagram of the car showing all constructions is given in Fig. 419.

Starting and Operating

In starting the car the operations are as follows: First the lock switch on the steering wheel is turned to the "on" position, which closes the main switch operating solenoid at this point and the ignition circuit also is closed. Next the outer finger lever is moved a short distance up on the sector, which closes the circuit of the main switch solenoid at another point. The circuit of the main switch solenoid is now complete and the main switch closes, causing the car to start forward as an ordinary electric. To start the engine the inner finger lever is moved up on the sector a short distance. The first motion of this lever opens the throttle slightly and further movement closes the magnetic clutch circuit and opens the throttle more. As the throttle is opened up still more the engine speeds up or tends to do so and thus assists the electric motor in propelling the car. If the field resistance of the motor remains fixed in value and the power supplied by the engine is increased by opening the throttle, then the

speed of the car will be increased slightly and the engine will supply a larger and larger part of the total power supplied to the propeller shaft until the motor is delivering no power at all, as the voltage generated in its armature at this higher speed is then equal and opposite to the voltage of the battery. A further increase in speed changes the motor to a generator and it starts to charge the battery. The speed at which the machine changes from a generator to a motor or from a motor to a generator will depend upon the value of the resistance in the field circuit, provided the battery voltage is constant. The lower this resistance the lower the speed at which this change takes place. Weakening the field of the dynamotor lowers its voltage and decreases its generator action if it is acting as a generator or tends to increase the speed if it is acting as a motor.

It is possible to run the car on the gasoline engine alone with the dynamotor entirely disconnected from the battery. To do this press down on the heel piece of the right-hand pedal which will open the circuit of the main switch control solenoid and disconnect the batteries from the armature of the dynamotor entirely. The armature is still revolving and current for the shunt field winding and the magnetic clutch will still be generated. The clutch, however, opens when the speed of engine has dropped to such an extent that there is not sufficient voltage generated to produce the required current in the magnetic clutch.

Magnetic Braking

If the voltage in the armature of the dynamotor is greater than the voltage of the battery, a charging current will be sent through the battery and the dynamotor acts as a generator. Power, of course, is required to drive the armature of the dynamotor when it is delivering power to the battery and this power, as in the case of dynamic braking, may be derived from the rear axle due to the tendency of the car to run down hill or coast. This braking effect can be increased by cutting out resistance in the field circuit, which is done by the right-hand pedal. The right-hand pedal when moved part way forward produces dynamic braking and when moved all the way forward applies the mechanical brake. This results in the energy stored in the car being transformed into electrical energy in the battery instead of being wasted in heating and wearing the brake bands.

The charge and discharge currents of the battery are indicated by an ammeter arranged to read in either direction. It is capable of reading discharge currents up to 120 amperes and charge currents up to 60 amperes. A so-called gravity meter, which is nothing more than an ampere-hour meter calibrated to indicate specific gravity, also is provided. The dial of this instrument is divided into three zones, the two end zones, referred to as danger zones, being red, and the center zone, referred to as the normal operating zone, being white.

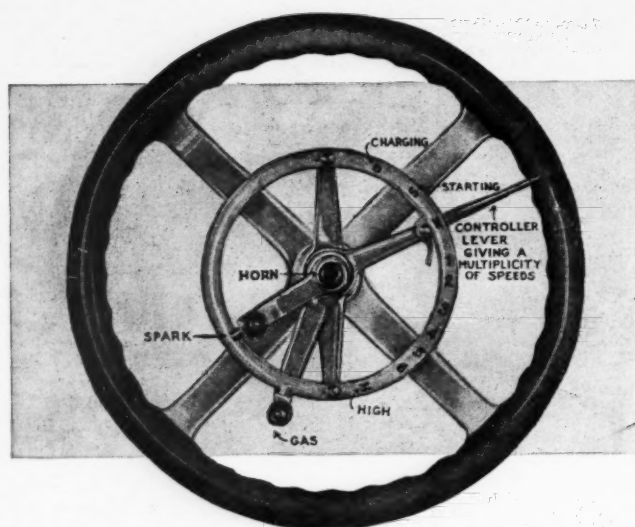


Fig. 421—Controller lever on steering wheel for Entz magnetic transmission

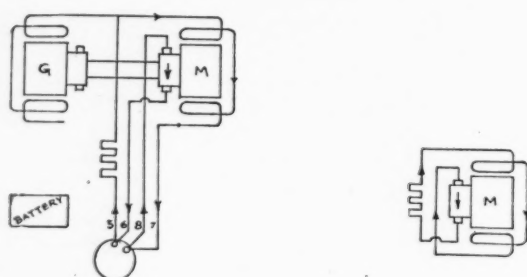


Fig. 422—Connections for neutral position of controller and electric brake

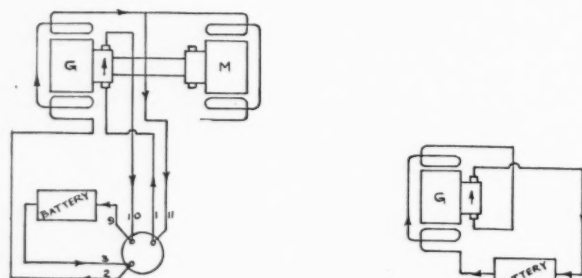


Fig. 423—Connections for cranking position of controller

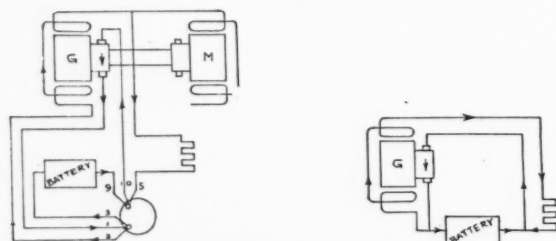


Fig. 424—Connections for charging position of controller

Entz Transmission

The principle of operation of the Entz transmission is really that of the clutch. The Entz transmission is an electro-magnetic clutch which is always slipping, sometimes a great deal, sometimes a very little; and the energy dissipated by the slip is recovered to be used again later on. If a car had a clutch made of some material which could not be burnt or worn out, it would be possible to arrange a transmission by a purely mechanical device for tightening or loosening the grip of the clutch, but if this were done, the instant the clutch began to slip energy would be wasted in the form of heat. This heat energy could not be recovered, and also the more we wanted to use the slip so as to give the effect

of a lowered gear ration, the greater the proportion of the energy that would be wasted.

The Entz magnetic transmission is a clutch that can be tightened magnetically, but the slip creates electrical energy instead of heat energy, and this electrical energy is used to drive the car. The power of the engine is delivered at high speed, and relatively low torque, and transformed into power at low speed and high torque at the rear axle without any direct mechanical connection through gears or a slipping mechanical clutch of any kind.

The two essential elements of the electrical transmission are units of electrical machinery that central station work or nearly two generations has proved good and reliable. Added to this is the extremely important point that the brushes and commutator bars which are the only parts of an electric generator that are at all likely to wear out are hardly ever used anything like so hard as they would in lighting service. Like all other transmissions, the Entz transmission does most of the work on high gear, and the difference in the speed between the electrical moving parts is then only from 60 to 100 r. p. m., as compared to several hundreds of revolutions for a central station dynamo or several thousand for motor car lighting generator. It is thus obvious that so slow a rubbing speed of brushes on the commutator as this can produce but very little wear, and the life of the parts ought to be very good.

General Arrangement of Parts

Turning to Fig. 420, which is a cross-section of the complete transmission, it is seen that the field magnets and coils of the generator form the flywheel of the engine. Neglecting the motor part of the transmission, the armature of the generator is on a shaft running free from a spigot ball-bearing in the flywheel and attached at the other end to the driveshaft and so to the level pinion of the rear axle. Thus the field of the generator runs always at propeller shaft speed.

The effect of running the engine and so spinning the field magnets of the generator is to reduce currents in the armature which make a magnetic attraction between the armature and the field. This is equivalent to tightening the fields upon the armature if we follow the clutch analogy, so the armature tries to turn with the field and will do so if the resistance to motion of the car as a whole is not too great. This means that part of the energy delivered by the engine is used in developing electrical energy in the armature and part to the direct mechanical work of turning the propeller shaft and so driving the car. Now this electrical energy which is developed in the armature of the generator is taken to the second part of the transmission, which is an electric motor. This is also shown in Fig. 420, and its field magnets are fixed stationary, while the armature is keyed to the same shaft as the armature of the generator. Thus, whatever else happens the two armatures are always running at the same speeds, and that speed is the speed of the propeller shaft.

Various Positions of Controller

On the foot, or lower, end of the steering column is an aluminum core containing sundry resistance coils and several switches. The effect of moving the controller lever on the steering wheel is described in electrical terms, and the description should be read with continuous reference to Fig. 420, as well as the various circuit diagrams given for each position of the controller, remembering all the while that:

- The generator field runs at engine speed.
- The motor field is stationary.
- Both armatures move together at propeller shaft speed.

Neutral Position—All circuits are open and no electrical energy is being generated or used. The battery is idle unless in use on the lamp circuit at night. A diagram of the connections for this position is given in Fig. 422.

Cranking Position—Current from the battery is switched into the generator, causing it to behave as a motor and spin the engine. The connections are shown in Fig. 423.

Charging Position—When the control lever is in the charging

position, the battery may be given a much higher rate of charge than would be safe to establish for running conditions. So that if, for any reason, the battery should be run down, it can be brought up in a short time, as a high rate of charge is permissible for a battery that has not reached the gas point and is not warm. The connections for this position of the controller are shown in Fig. 424.

First Speed Position—Generator is producing light clutching effect and supplying maximum current to the motor. There is a maximum difference between engine and propeller shaft speeds, and greatest torque or pulling power is being developed. Connections are shown in Fig. 425. The generator field is shunted so as to weaken it, while the motor field is full strength, being unshunted.

Second Position—Clutching effect of the generator is increased and the current supplied to the motor is decreased, which results in the car speeding up. The connections are shown in Fig. 426. Both the fields are unshunted, but the motor field is still the stronger, due to its being wound with more turns.

Third Position—Clutching effect of the generator is increased further and transmits more of the driving power direct to the propeller shaft. The motor does the work and the car increases in speed. The connections are shown in Fig. 427. The generator field is unshunted, but the motor field is shunted, and it is weakened as compared with the generator field, in which case it gives less torque for a given current but also less counter electromotive force, and therefore less slip at the generator.

Fourth and Fifth Positions—The generator does more work and the motor less at the fourth position than in the third position, and there is a similar change in passing from the fourth to the fifth position. The generator field is unshunted but the motor field is shunted, and the resistance of this shunt is decreased as the controller moves toward a higher position.

High Speed Position—In this position the generator clutching effect has increased to nearly locking point, and all the driving power is being transmitted direct to the propeller shaft. The motor no longer assists the generator but itself acts as a generator to charge starting and lighting. The connections are shown in Fig. 428. It will be noticed that the motor has a shunt field in this position of the controller, which is opposed by a series field in the battery circuit, making it a differential generator with an inherent self-regulating character.

Electric Braking

An additional feature of the transmission is to provide an extremely powerful electric brake which automatically releases as the car slows down. It cannot be used for stopping the car altogether, because its braking power depends upon the motion of the vehicle, but it is very effective when the car is traveling fast. If the controller lever be put into the neutral position when the car is running, the heavy current induced by the motion of the car in the circuit shown at the right in Fig. 422 causes a heavy retarding action to the progress of the car. On grades this electric brake will keep the speed down to 15 or 20 m. p. h.

Merits of Entz Transmission

Some of the merits of this transmission as pointed out by its manufacturers are as follows: In this system there are no automatic cutouts or regulators or roller ratchets. There are no chains or gear drives for any of the parts. There are two ample

DRIVE FOR SKILLED MEN ON

Chicago, Dec. 23—To meet the urgent demand for mechanics in the aviation section, the Government to-day opened offices in the Packard Motor Car Co.'s salesroom and will continue its drive for skilled men until Wednesday. The service is classed as the military-industrial branch of the army. Major E. V. Summer is in charge of the examination of men. The call is for men over twenty-seven who are experienced

garage superintendents, foremen and mechanics. Four regiments are wanted. One hundred and sixty lieutenants, sixteen majors and eight captains are needed. Commissions will be given without regard to military experience. It is another chance for the skilled man to use his knowledge. The effect will be to induce men who heretofore have held back for lack of military training to come forward and offer their services for this vital branch of the army.

MAY STOP COAL GAS USE

London, Eng., Dec. 15—So great has been the demand for gas bags to carry coal gas on which to run motor cars that factories are filled with orders for these bags and some factories have enough orders to keep them running until next spring. Owing to the fact that so much labor may be required restrictions putting the use of coal gas on practically the same plane as that of gasoline are expected.

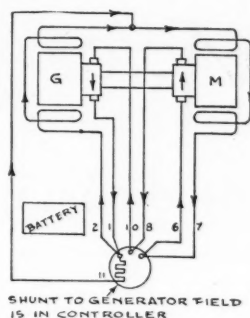


Fig. 425—Connections for first-speed position of controller

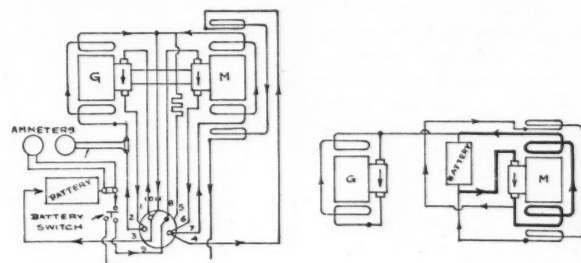


Fig. 426—Connections for second-speed position of controller

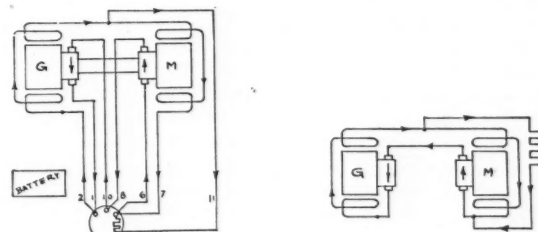


Fig. 427—Connections for third-speed position of controller

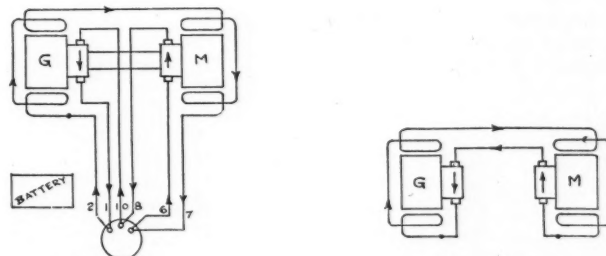


Fig. 428—Connections for sixth-speed position of controller

sized dynamo machines, direct connected, and a drum controller. These take the place of separate starting and lighting systems with their complicated means of driving and regulation, of the friction clutch and its actuating mechanism, and the gearshifting transmission, as well as such telescopic and universal joints and numerous grease cups that attend them. The car can be brought up to speed without a jar or jerk. All power impulses of gasoline engine are practically eliminated, and the torque delivered by the propeller shaft to the rear axle is very uniform. The speed of the car is easily managed in traffic and on grades without the necessity of shifting gears.

The Motor Car Repair Shop

Causes of Misfiring and Their Remedies

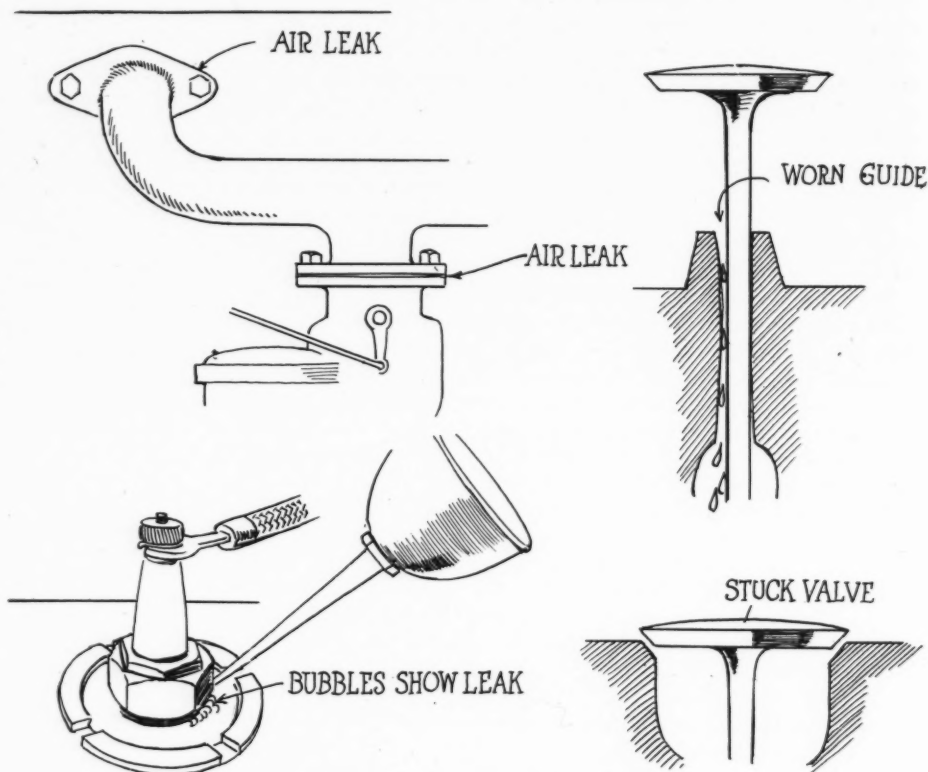
THERE are many motorists who through lack of confidence in the ability to locate engine troubles will drive for considerable distances at times with their engine misfiring badly. There are some, in fact, who drive their cars continually and hardly know what it is to have the engine hit on all cylinders evenly. To be very plain, every time a cylinder misfires, there is jerk throughout the entire mechanism from the crankshaft of the engine to the treads on the rear tires. Each jerk is a strain on the crankshaft, clutch, universal, gearset, propeller shaft, rear axle, wheels and tires. Consequently these parts wear faster than they would if the engine was hitting evenly on all cylinders.

It goes without saying that whenever an engine misfires in one or more cylinders, there is some good reason for it. On this page four common causes for misfiring are shown, although these are by no means all of the reasons why an engine misfires. One of them shows air leaks around the joints of the intake manifold, where the latter joins the cylinder block and at the carburetor flange connection. If these joints have been properly made when the assembly was taken down the last time, there is very little chance of them leaking air. In fact, air leaks around the intake manifold are quite rare nowadays, due perhaps, to better workmanship in shaping the parts and the use of copper gaskets. Should the owner suspect a manifold leak he can easily find out if it is causing trouble by squirting gasoline around the joints when the engine is running quite slow. If it picks up in speed, there is a leak, for the additional gasoline supplied mixes with the air leaking into the manifold and the action is equivalent to opening the throttle slightly.

Leaky Spark Plugs

Leaky spark plugs are frequent offenders in causing misfiring, not so much that the plugs themselves leak, but the threads of the shell fit too loose in the tapped hole of the cylinder. A leak of this kind can be easily found by squirting a little gasoline around the plug. If bubbles arise with the engine running, the plug is leaky. It should be taken out and graphite applied to the threads, which not only acts as a seal, but makes the removal of the plug an easy matter later on.

A worn valve stem guide is often responsible for irregular running. Such a guide not only allows air to be sucked into the cylinder, but permits oil to flow out. In fact, a fair test for leaky guides is to look for oil which has leaked through. Now and then a valve gets stuck in its guide, due to foreign matter which slows up the action of the valve, so that the spring cannot return it to its seat fast enough. Thus the valve is held in a partially open position, which naturally causes the engine to miss. Sometimes a valve stem gets bent in which case it is apt to stick. By far the majority of cases of misfiring, however,



Four common causes for misfiring of cylinders

can be traced to some defect in the ignition system, and the first thing to suspect is a fouled or defective plug.

First determine which cylinder is misfiring. If the misfiring is not in the same cylinder all the time, then the trouble may be with the mixture. If one cylinder is found which is causing the trouble confine your efforts to that one. Remove the spark plug and lay it upon the cylinder with the wire attached and turn over the engine with the ignition switch turned on. Note if there is a spark at the points. Remember there must be a good spark in order to make sure that the plug will function in the cylinder, where it must fire the charge under compression. If the spark is feeble with the plug out of the cylinder clean the points with kerosene and adjust them so there is a gap of about $\frac{1}{8}$ in.

After a magneto has been in use for a considerable length of time, misfiring and consequent loss of power may be due to lack of sufficient heat in the spark, caused by weak magnets. In this case misfiring will be more apparent at low speeds, when the magneto is not operating at a high enough speed to generate a strong current. The best remedy for this is to have the magnets recharged, but temporary relief often may be had by adjusting the points of the spark plugs so that all of them are brought a little closer together; and all the same distance apart. If the gaps are not all the same distance apart, the plug with the widest gap will be the first to misfire,

as a result of weak magnets. A plug that has a cracked porcelain will misfire and the same is true of one on which the cable is loose. On some cars like the Ford, which has low-tension wires running from the timer to the coil box, care must be taken to see that the insulation on these is not rotted off at the timer end, where a great deal of oil is thrown out of the breather pipe. A wire that is broken internally, does not show through the insulation and is often a cause for mysterious missing. Such a wire may at times cause irregular firing due to the ends at the break separating. To detect a broken wire like this, pick it up and move it about, leaving the ends connected. Note the action of the engine and if there is an improvement in the running, it may be that the two parts of the broken wire have been brought into contact. Another way is to run a second wire, which is known to be in good shape, between the two points. Misfiring that is apparent in all cylinders may sometimes be traced to improper setting of the platinum points, or the latter may need truing with a very fine file. Points that are rough occasionally stick, causing a falling off in the spark.

If plenty of heat is furnished to the carburetor air intake and the mixture set correctly as possible, there is not much cause for suspecting the carburetion, if the engine misses. It is true that too lean a mixture will cause misfiring, especially when the engine is running slow. On the

other hand, a rich mixture, which may facilitate starting, will be far too heavy for ideal running and the engine may load up, causing it to misfire and eventually cease running altogether. As a general thing if the engine has been running properly up to the time the misfiring became evident and the carbureter adjustment has not been changed, it is safe to assume the trouble to be anywhere but in the carbureter. However, if the misfiring occurs in all of the cylinders, that is, not in any one in particular, there may be some slight defect in the carbureter, such as a sticking float valve, dirt on the needle valve seat, etc.

Needless to say when an engine is tuned it should be warm and no attempt made at adjusting the breaker points, valves, carbureter, etc., until the engine has been run for some time. Also when first starting out, the engine should be given a chance to heat up by letting it run slowly in the garage. This gives the oil a chance to be distributed over all of the parts and there is less chance of stalling on the road. Some owners remove the hot-air pipe on the carbureter in very hot weather, but this is not generally recommended, as the fuel we get these days demands all the hot air we can possibly get through the carbureter. Bend the fan blades if the engine shows signs of overheating, and make sure there is oil on the cylinder walls.

Repairing Truck Tires

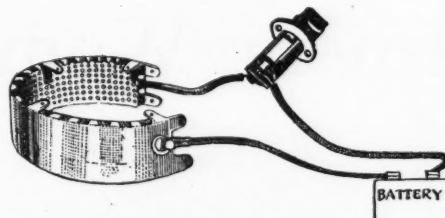
Editor MOTOR AGE—Now trucks operating in every conceivable kind of service are rolling on large pneumatic truck tires, we are often asked what is the most satisfactory method of repairing tires that have suffered tread or carcass injury.

In the first place any repair, to be successful, must actually be worth at least the amount of money invested in it, and repairs on large tires are naturally more expensive than on small ones. So the first thing to be determined is whether the service that can reasonably be expected warrants the outlay of the expense involved.

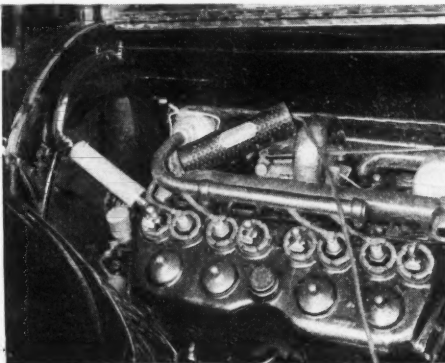
Small cuts in the tread and the sidewalls should be promptly repaired with tire putty by the truck driver, to prevent gravel and water from entering, which would cause enlargement of the cut and eventual separation of the tread from the carcass. The most dangerous tread cuts are found in the grooves between the diamond-shaped blocks of rubber.

If the cut is too large to be repaired by the use of tire putty it should be taken to a repairman. The treatment of such a repair in a large pneumatic truck tire is the same as that used on tires for passenger cars, except that the large tires are vulcanized in tread and side-wall surface, sufficient heat for vulcanization cannot be secured in a sectional mold. It is absolutely essential that a repair on a pneumatic truck tire be properly cured. So to insure a perfect job the pot-heater system is used, and the repair vulcanized in open steam.

It is our aim to build a perfectly balanced tire—one that delivers its full service before any particular part of the tire gives way, and we, therefore, put on a tread intended to wear until the carcass of the tire has outlived its usefulness. So



Line electric carbureter heater



Consolidated heater in operation

that when the tread has worn down pretty well, it is obvious that good wear has been obtained.

Many motorists are in the habit of retreading their passenger car tires when conditions are right, but we do not recommend the retreading of large pneumatic truck tires when tread separation has developed. In cases of premature tread separation a retread will in all probability be no more successful than the original tread. Tires that are constructed properly and used properly should not develop tread separation. But when this does develop, the tire should be run as long as possible—for the carcass alone is strong enough to hold up for several hundred miles. The job of retreading could, of course, be done, but its economy is doubtful. Fortunately our tires seldom fail because of this condition.

Continued use in many kinds of service in all sections of the country has shown that these big tires are not susceptible to any class of injuries that cannot be repaired in a manner similar to that used in the repair of tires for passenger cars. Our pneumatic truck tires are made in the cord construction and are, therefore, not liable to many of the failures that fabric tires are subject to. Our experience with these big tires in actual service confirms our previous belief in their practicality.—Goodyear Tire and Rubber Co.

HEATING THE ENGINE

(Concluded from page 21)

desired, through a heating radiator in the passenger compartment, finally returning it to the radiator. It thus answers two purposes; first, it keeps the engine and radiator at a temperature assuring easy starting and, secondly, provides means for heating the driving compartments. Two sizes of heaters are furnished, depending on the size of the car to be heated. The price of the compartment radiator is extra.—Underhood Motor Heater Corp., Detroit.

Line Carbureter Heater—This heating device consists of a resistance coil which is wrapped around the bowl of the carbureter and utilizes the current from a set of

dry cells or the conventional 6-volt storage battery, using about 5 amp. The current is controlled by a switch on the dash and when the circuit is closed, the heat generated by the resistance coil warms the carbureter and in turn the gasoline therein, thus making it much more volatile. It is made to fit any make of carbureter and no holes need be bored in installing it. About 2 min. time is required to heat the carbureter sufficiently on a cold day, it is stated. The outfit includes, besides the heating element, a switch and necessary wiring. Price, \$4.—Mechanical Utilities Corp., Chicago.

GERMAN OIL ECONOMY NOTES

Washington, Dec. 21—News from Germany by way of Denmark indicates that the machine shops of that country are giving hints on economy in lubricants which should be valuable in any country. They are:

Use only closed oil cans, with spouts that will deliver drops, or at most only a thin stream.

Use all lubricating apparatus strictly according to the instructions, and put the oil only where it will actually lubricate. If a machine has automatic droppers, shut off the supply while machine is standing.

Do not use cylinder oil on shafting or elsewhere when cheaper oil will answer.

Keep all rubbing surfaces in good condition. Rough surfaces and too-tight boxes consume more oil. Worn and leaky bearings waste oil.

Always use drip pans and arrange to filter and cleanse the oil so caught. It is as good as new.

Collect all greasy waste and wiping cloths, so that the oil may be recovered. Never burn them.

Be careful about using lubricating oil for cooling a bearing. Water will often do as well.

Be careful about using oil for cleaning and polishing. Never clean the hands with oil. A greasy cloth will do as well.

SET PRICES FOR USED FORDS

Detroit, Dec. 22—The Ford Motor Co. has determined the maximum price that may be allowed by its dealers for all used Fords taken in trade and is charging the dealers that any amount greater than that listed will be taken from their profits. To bring the amount listed, the car must be in the best possible condition, and the number of cars sold in any one instance is in no way to affect the allowance price. The following is the list, as supplied to local dealers on all Ford models:

Model—	1912	1913	1914	1915	1916	1917
Touring	\$85	\$90	\$100	\$135	\$150	\$225
Roadster	75	80	90	125	140	215
Coupelet				240	285	300
Coupelet				(new style)		400
Sedan				325	375	525

That this list is altered to meet the conditions in various parts of the country is indicated by the allowance prices for used Fords published by the Baltimore dealers. The list follows, and in general will be seen to run from \$10 to \$50 higher:

Model—	1914 and earlier	1915	1916	1917
Touring	\$150	\$175	\$190	\$235
Roadster	125	150	160	200
Chassis	100	125	135	165

The allowances for various accessories common to Fords also is listed. In the case of electrical starters, the allowed price is half the retail price of the starter, and for the other accessories, it is in general $\frac{1}{4}$ the retail price of that accessory.

From the above table, the Ford dealer is enabled to determine the value of the car, by deducting a certain amount for poor condition and adding on the assessed value of the accessories.

The Year Among Woman Drivers



Two American girls who are members of the motor corps of the National League for Women's Service. They will drive an ambulance and a motor truck in France for the women's medical unit for foreign service of the New York Infirmary for Women and Children

IN a review of the year issue it is by no means amiss to look back over the last few months and consider as to what changes have come in the feminine side of motoring. Such a retrospect is particularly apt this year of all the years in which the hand of the woman on the wheel has been a factor in deciding what kind and to no small degree how many cars the industry shall sell.

This is a particularly apt year in which to make a resume of the year for the woman driver because there has been so much to broaden the woman's field as a driver of cars and even as a repairer and sales element. This effect has not been exactly similar to that on the English woman. The American woman from the first has had a greater initiative in driving than her more conventional cousin across the waters. Since the beginning of hostilities, however, the English woman has become a driver in a commercial position and in a wartime position. Thousands of English women today are serving in France, most of them, it is true, in positions more domestic than motorized, but many of them as drivers of ambulances and supply trucks in the less exposed districts. At home in England they are driving the cars of officers, the trucks of the big department stores and from there on down to the light truck, or lorry as they call it, that brings the vegetable truck to town.

The effect on the American woman driver has not taken such a pronounced turn to unnatural—we would call it such in normal times—service as a motor driver. The change is more apparent in the larger number of women at the wheels of cars in the street, going to and from shopping, taking the family about its business, in

many cases acting as a carry-on for the young brother who has enlisted or called.

True enough, the women of America are giving their services as drivers to war work of various kinds, this work extending to driving of trucks in some instances. But this has been considered before and by now is a part of common news. The woman who would never have learned to drive had the United States not entered the world war back there in April is the one most affected, and the one affected in the largest numbers. Many American women have been trying since the beginning of the war to get permission to drive a car or truck within speaking distance of the firing lines. The entrance of this country into the war merely made the need of their service seem more necessary and more probable. But the woman who grew to know the absence of a chauffeur through conservation, other needs or what not, and stepped into the place at the wheel is the one really affected.

In brief, one might say the main effect of the war on the American woman as a driver has been to hasten her emancipation from dependency on another's skill, so that the future effect of women on design in cars and sales of cars and repair of cars is more than likely to grow to tremendous proportions. There will be a greater demand for labor-saving devices about the car, a wider field for the dissemination of knowledge concerning the motor car, an increased need for the service station and garage to extend their establishments. More attention even than the makers are paying to comfort in the construction of a car will be necessary. There will be no let-up on the question of mechanical ease of operation. In return, the demand for the motor car is certain to be even more

universal than it is. More families will have them, because more wives and daughters will learn to operate them and to want them.

In making this review of the year from its feminine aspect it might be well for all women who are interested in cars, whether as drivers or as passengers, to consider the growing importance of the car in waging the war. It has been proved in the face of very strong opposition that the passenger car is an essential, both to the waging of the war and to everyday life in time of war. Provided a man or woman look to the useless consumption of gasoline in the many leaks a car seems heir to and unites with the Government in those things that mean so much to the successful fighting of our soldiers and sailors—food conservation, Liberty loans, Red Cross and recruiting—no one can mark him or her as unpatriotic. The motor car industry is giving of its men, money and plants, and motorists are proving their patriotism to such an extent that few privately-owned cars pass a month in which they do not render some war service, directly or indirectly.

Who Conserves?

Only one real difficulty has arisen in securing hearty teamwork in food saving, that is, a certain suspicion on the part of the public that savings effected by business concerns are not being passed along to the consumer, says the Food Administration, thus expressing the opinion of many.

People go into a hotel dining room, and find meat portions reduced, and want to know why prices are not reduced correspondingly.

They carry home bundles from the stores and pay cash, but are not certain that their teamwork benefits anyone except the merchant.

At one of the large New York hotels reductions in prices are stated in percentages on the bill of fare. This is not only a commendable way to meet criticism, but it touches the very heart of the problem—namely, that when people suspect unfair methods on the part of the hotel man or merchant they probably do not know prices, and would not see the difference in a price reduction unless it was pointed out. It might well be that war-time hotel menus could take a hint from department-store pricing, and itemize their dishes in some such style as "Roast beef, 48 cents, reduced from 60 cents." That illustrates the idea at least, and if the hotel man would run a footnote on his menu stating that a 25 per cent reduction in price had been made in each dish where the portion had been reduced, this would be reassuring to the public.

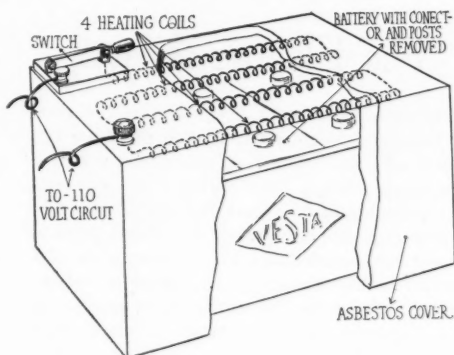
Likewise, in the retail store, actual reductions on purchases in delivery or for which cash is paid could be stated in money or percentages.

"The public always helps when the public knows." Guesswork and suspicion are the basis of most misunderstanding in these matters, and a campaign of education will do much to straighten out tangles.

The Accessory Corner

Ratchet Tap Wrench

THE ratchet tap wrench made by the following concern comes in two sizes, No. 1 for taps from 4 to $\frac{1}{4}$ in. and No. 2 for taps from $\frac{1}{4}$ to $\frac{1}{2}$ in. It is made with a sliding T-handle, permitting its use in corners. The handle can be held center by a dog which automatically fits in a milled flat surface of the handle. Adjustment is made immediately to either right or left ratchet or rigid by turning a knurled sleeve. The chuck and ratchet are carefully hardened, and all other parts are substantially made, insuring unusual durability. Prices, No. 1, \$2; No. 2, \$2.50—Moss-Ochs Co., 3387 East 116th street, Cleveland, Ohio.



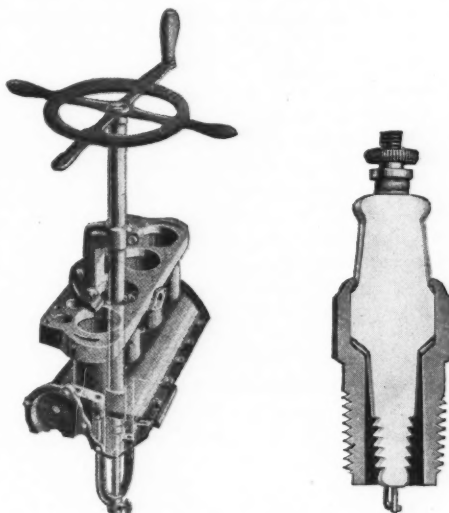
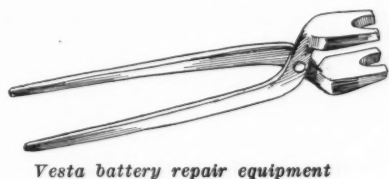
est taper. The device is self-centering, centering itself from the unworn portion of the engine, weighs 45 lb., is operated by hand and is very simple in construction. The cutting bits are sharpened and given the correct amount of clearance without an emery wheel. Oversize pistons, complete with rings, pins and bushings are supplied for \$1.25. The price of the machine is \$38.—Heiser Special Tool Co., Kingston, Mo.

Econ-O-Kleen for Cars

Econ-O-Kleen is a liquid which supplies oxygen to burn up waste carbon expelled through the exhaust or remaining in the interior of the engine. It acts as an interior lubricant, cleansing the cylinders, and is a scientifically-compounded preparation which, it is claimed, will not injure the engine in any way, clog the gasoline pipes, pit the valves or harm the lubrication. A \$1-can, complete with measuring cup of a handy size to carry in the car, treats 112 gal. of gasoline.—Econ-O-Kleen Fuel Co., Thief River Falls, Minn.

Vesta Battery Repair Equipment

Battery tops may be unsealed and removed readily through the use of a special electrical heater provided for that purpose, without removing the electrolyte from the cells. The device consists of an asbestos board box, or oven, in the top of which are four heating coils of No. 18 temperature resistance wire. This box is placed over the battery after the connectors have been removed, and the current turned on. After about 10 min. the heat from the coils so softens the sealing compound that the plates may be lifted from place. The cost of operation is about 10 cents an hour, as the heater consumes 10 amp. on a 110-volt line. The price is \$15. In addition, terminal tongs are provided for removing taper terminals that have become seated or corroded in place. One jaw of the tongs grasps the post at the base of terminal, the other forcing it from place without injury. These cost \$1.65 a pair.—Vesta Accumulator Co., Chicago.



Climb-Out and Shovel

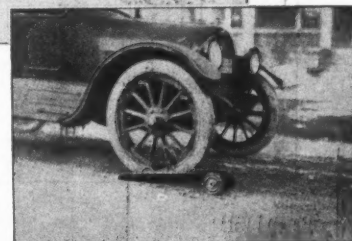
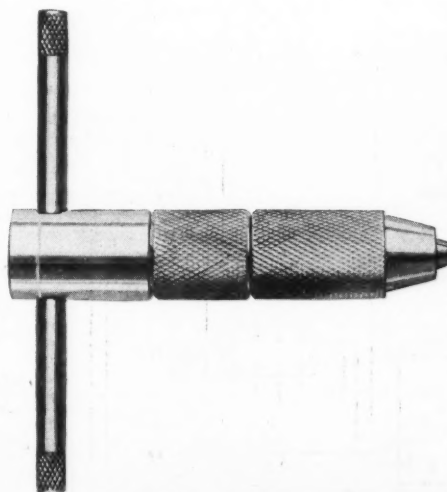
This device, styled the Climb-Out and Shovel, serves first as a shovel to make a path for the mired wheel and then as a track on which the car may be run from the hole. In addition a wheel attachment is provided whereby the device may be used as a wrecking truck, when one wheel is disabled. It consists of a metal trough in which are a series of tire cross chains, providing traction. One end is beveled to form a shovel edge and the other is metal capped, carrying a bearing and a wheel attachment and serving as a handle. In addition the Climb-Out may be used as a jack foundation in soft ground.—S. H. Heginbottom & Co., 312 Bearinger building, Saginaw, Mich.

New AC Plug

The makers of AC plugs have placed on the market a new type, known as the AC Carbon-Proof, designed primarily to overcome carbonizing trouble in a kerosene-burning tractor. The results were so gratifying the plug is now made for Ford, Overland and Studebaker cars and in a test on Ford cars covering a year, no instance has been found where a plug had to be removed on account of carbonizing, it is claimed. The porcelain is provided with ribs that have sawtooth edges which attain a sufficiently high degree of heat to burn away the carbon, thereby keeping the edges free from deposit and breaking up any possible short-circuit.—Champion Ignition Co., Flint, Mich.

Cylinder Reboring Machine

Heiser's improved cylinder-reboring machine for Ford engines has a range of adjustment large enough to cut away the entire cylinder wall and can be used to fit a set of over-size pistons in from 60 to 90 min. The arrangement of the machine is such that the bar may be removed without losing the center. After one cut has been made the piston may be tried. If it will not slip in another cut can be made. When the proper size has been determined several cylinders can be bored accurately without changing the adjustment. The boring bar is guided with absolute accuracy, it is said, by the two pilots, and rebores between centers without the slight-



Two views of Climb-Out-and-Shovel

The Readers' Clearing House

The Electric System

Ignition System Query

Q.—Would an Atwater-Kent ignition system be satisfactory on a Dodge Brothers car if everything else is all right?—Fred Rathel, Daleville, Ind.

There is no reason why this system could not be mounted so that it would work satisfactorily.

Wiring Exide Battery

Q.—How can an Exide 24-volt battery be wired to give 12 volts on lighting system and 24 volts on the ignition, so that the charging wires from generator will charge entire battery without burning out the lights?—Frank A. White, Chicago.

The charging lines from the generator should connect to the positive and negative terminals of the complete battery. The battery is made up of twelve cells of 2 volts each; thus in order to charge the entire battery all twelve cells must be in the charging line. To have the 24 volts for ignition, the lines for this purpose would necessarily come from the same terminals to which the charging lines from the generator are connected. If six of the cells in the battery are connected in the lighting circuit this will give the required 12 volts. When making the connection at the sixth cell of the battery for the lighting circuit be sure that the correct terminal is used; thus if the outer terminal is positive, the terminal used on the sixth cell should be negative.

Charging Storage Battery

Q.—Give me diagram and instructions for charging the 6-volt Willard battery on my Oakland 6, model 32, from the 110-volt direct-current in our town.—C. M. Vertrees, Cecilia, Ky.

The manner of connecting a storage battery for charging from a 110-volt direct-current is shown in Fig. 2. As long as you have direct-current you will not need a rectifier and charging your battery will be quite a simple matter. Make the connections as shown. Six carbon filament lamps are connected in parallel with each other and the combination is in series with the battery. Each lamp will represent a charging current of about 1 amp. for a single battery of three cells.

Be sure to connect the positive terminal of the charging circuit to the positive terminal of your battery as otherwise you will discharge rather than charge the battery. The polarity of the charging circuit may be determined by immersing the bared ends of two wires which have their other ends connected to the circuit, in a vessel of water, being careful to keep the ends some distance apart so as to prevent a short circuit. Bubbles of gas will rise from about the ends of the wires, but considerable more gas will be given off about the negative terminal than from the positive. This nega-

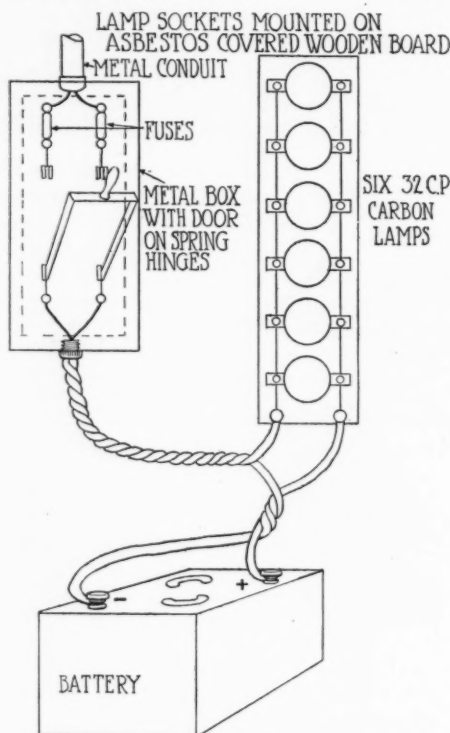


Fig. 2—How to connect a storage battery for recharging

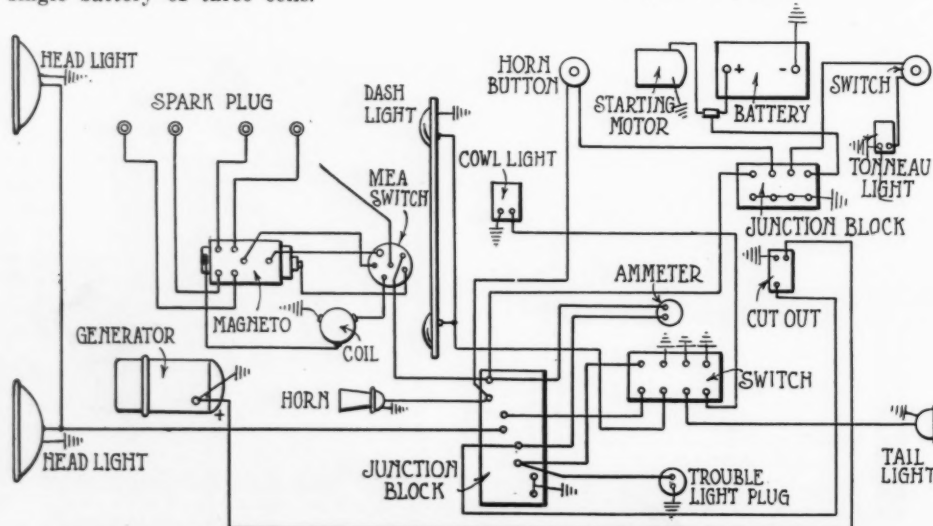


Fig. 1—Wiring diagram for one-wire system on 1913 Stearns-Knight car

tive wire should then be connected to the negative terminal of the battery or to the one marked with a dash. There are other simple ways to find the polarity of the charging circuit and some of these are shown in Fig. 3.

The lamps used for resistance will burn, but not as brilliantly as ordinarily. This fact also is an indication whether or not the battery is being charged in the proper direction. The more batteries you charge in one series the dimmer the lights will be as the electrical pressure taken by the batteries takes just so much from the lamps.

Start the charge at a rate equal to the normal charging rate or lower—the charging rate is usually stamped on the battery—and continue the charge until the cells gas freely. This will ordinarily take about 6 hr. Then continue the charge for 6 hr. at the normal finishing rate. A battery is charged when, with the charging current flowing at the finish rate, all cells are gassing or bubbling freely and evenly and the gravity of all cells have shown no further rise during about an hour's time.

Wiring of 1913 Hudson

Q.—Show wiring diagram of Hudson car, model 37.—F. C. F., Deming, N. M.

This diagram is shown in Fig. 5.

Dodge Brothers' Wiring Diagram

Q.—Publish wiring layout for a 1917 Dodge Brothers touring car.—Fred Rathel, Daleville, Ind.

This is shown in Fig. 4.

One-Wire System on 1913 Stearns

Q.—Show wiring diagram for putting one-wire system on Stearns-Knight model 1913.

2.—Show wiring diagram for installing Gray & Davis starting system on Stearns-Knight model 1913.—W. B., Chicago.

1.—This diagram is shown in Fig. 1.

2.—This is also shown in the diagram.

Timing Ignition on Little

Q.—Explain how to time a 4-cylinder Little. The magneto was taken off some time ago, and the engine has been turned over. How must I set the engine and magneto so that they will fire right and what is the firing order?—J. L. King, Detroit, Mich.

To replace the magneto and have it in proper relation to the engine crankshaft, turn the engine over until the inlet valve in No. 1 cylinder has closed. It will now be necessary to locate the upper dead center of the piston when it is beginning its power stroke. To determine this position, insert a wire through the spark plug or priming cup aperture and turn engine over until its upper position is located. Then with the distributor arm set on the distributor board segment corresponding to No. 1 cylinder attach the magneto to the nearest hole in the magneto shaft coupling. The timing of the magneto should be such that the breaker points will just commence to open when the piston is on upper dead center with the magneto breaker mechanism in its fully retarded position.

To determine the firing order, turn the engine over until the inlet valve on No. 1 cylinder opens and then observe whether the inlet valve on No. 2 or No. 3 opens

next. If No. 2 opens next after No. 1 the firing order is 1 2 4 3 and if No. 3 opens next after No. 1 the firing order is 1 3 4 2.

Four Electrical Queries

Q.—Publish an ignition diagram of the Chalmers 15 showing magneto, Gray & Davis generator and battery connections.

2—How is generator wired to lights?

3—Give wiring diagram of Splitdorf model Z magneto.

4—What would cause magneto to lose its magnetism suddenly? Car ran O. K. on magneto, switch was shut off and it was found magneto was no longer serviceable. Wiring and coil were in good order, but magneto had lost its power in its magnets.—Frank A. White, Chicago.

1—This is shown in Fig. 8.

2—This is shown in Fig. 8.

3—This is shown in Fig. 6.

4—This could only occur when the pole pieces of the armature were at rest in a position such that, if a current from the battery was flowing through it, the magnetic generated flux would be in the proper direction to demagnetize the permanent magnets of the machine.

Location of Armature Trouble

Q.—Give instructions for testing an Auto-Lite generator armature.—J. G. Miller, Vernal, Utah.

The armature need not be removed from the machine to test it for open circuits or short circuited coils. To test for open circuits pass the current from one dry cell through the armature by means of the brushes and then using the 3-volt scale of a voltmeter and a pair of test points, connect these to the adjacent segments in the commutator. Test in this manner around the entire commutator and if there is nothing wrong with the armature the deflections of the voltmeter will be the same for all cases. If there is an open circuited coil it will show a greater deflection than any of the others.

To test for short circuited coils proceed as above but instead of the 3-volt voltmeter, a milli-voltmeter will be necessary. If there are no short circuits the reading will be about the same in all cases, but if there is a short circuited coil, the instrument will show a smaller deflection than for those that are not so affected.

Engines

Horsepower of Chalmers

Q.—What is the rated horsepower of a Chalmers model 18 6-cylinder?—Frank A. White, Chicago.

The N. A. C. C. rating of this model is 43.8 hp. at 1000 ft. per minute piston speed.

Cadillac Engine Misses

Q.—I have a Cadillac which will hit good as long as the car is not run over 10 m.p.h. Sent the carburetor to the factory and had it overhauled. Have two ignition systems, each independent of the other, and car acts same on both. The timing is good and compression is good. The platinum points and the distributor bearings are also good.—C. R. Keen, West Frankfort, Ill.

The missing of the engine may be due to a number of causes, namely, too rich a mixture for high speed, air leakage due to worn valve guides, or broken insulation in condenser or coil.

If the carburetor is too rich at high speed it will cause missing. The cause of this may be a weak high speed air valve spring, air valve sticks in guide, or the cam for lifting the needle may be badly worn. If

To assist readers in obtaining as a unit all information contained in this department on a certain subject in which they may be most interested, such as ignition, carburetion, etc., MOTOR AGE has inaugurated the segregation of inquiries into classes of allied nature. Questions pertaining to cooling will be answered under that head and so on.

THE ELECTRIC SYSTEM

Fred Rathel.....Daleville, Ind.
Frank A. White.....Chicago
C. M. Vertrees.....Cecilia, Ky.
F. C. F.....Deming, N. M.
W. B.....Chicago
J. L. King.....Detroit
J. G. Miller.....Vernal, Utah

ENGINES

Frank A. White.....Chicago
C. R. Keen.....West Frankfort, Ill.
Ed Dahl.....Storm Lake, Iowa
J. P. Renner.....Rush Center, Kan.
B. W. Rowley.....West Liberty, Iowa
George Huyck.....Topeka, Kan.

MISCELLANEOUS

A. G. Waterhouse.....New Haven, Conn.
George Huyck.....Topeka, Kan.
Albert Baxendale.....Indianola, Iowa
Josiah Fort.....Clarksville, Tenn.
Fred Rathel.....Daleville, Ind.
W. J. Crowley.....Golconda, Ariz.

REBUILDING

B. L. Guerin.....Chicago
No communication not signed by the writer's name and address will be answered in this department.

the trouble lies in the air valve spring, it will of course have to be replaced. Do not oil the air valve guide but remove it and clean it as the oil on the valve stem has a tendency to collect dirt and thus cause the valve to stick. On some of the cars a carburetor was used which had a cam device for lifting the gasoline needle and if this cam is worn it is almost impossible to secure proper adjustment of the carburetor.

If the valve stem guides are badly worn they will leak air and the mixture will be diluted with air to such an extent that missing will result. This leakage occurs on the induction stroke of the engine when the gas charge is being taken in and the only remedy for this difficulty is to install new valve guides.

The best indication of broken down insu-

lation in either the coil or the condenser is black breaker points. If these points are cleaned and become black after a few moments running it is a sure sign that there is trouble in either of the above.

No Six-Cylinder Knights

Q.—Are there any six-cylinder Knight engines made? If these are considered impractical, what is the reason?—Ed. Dahl, Storm Lake, Iowa.

The American cars now using Knight engines are using either the four- or eight-cylinder type. The Stearns and Stoddard formerly used the six-cylinder Knight engine and a number of foreign companies were using them before the war. For a medium-priced car the four-cylinder is better adapted, as it is easier to produce and more economical to maintain, while for a higher priced car the eight Knight does not cost a great deal more than the six and has better ability.

Knock in Buick Engine

Q.—I have a Buick model D-45, which has been run 14,000 miles. It has a knock which occurs from 22 to 30 m.p.h., or when running very slow and pulling hard. All bearings are in good shape and carburetor and time are O. K. The third cylinder seems to get too much oil, as the plug and cylinder are always dirty. I fitted new rings in this cylinder but it did not help. Would it be practical to make oil groove on the pistons and drill holes in it to let the oil work back to crankcase? Would it be possible for the knock in the engine to be caused by a spring crankshaft? What would cause the crankshaft to be sprung?—J. P. Renner, Rush Center, Kansas.

If the main bearings are so fitted that the crankshaft seats perfectly in all bearings the possibility of springing a crankshaft is least. No matter how well a set of main bearings are fitted if the crankshaft is sprung it will be impossible to keep the bearings tight for any length of time. The best way to determine if the shaft is sprung is to remove it and have it tested in a lathe for accuracy. Crankshafts in these cars have been known to become sprung through faulty application of the brakes.

The piston in No. 3 cylinder may be undersize enough to be causing your trouble. The clearance for the piston should not exceed .004 on the skirt. If the rings are well fitted and properly spaced they should not leak oil. An oil groove on the piston skirt about $\frac{1}{16}$ in. wide and about $\frac{3}{4}$ in. deep and

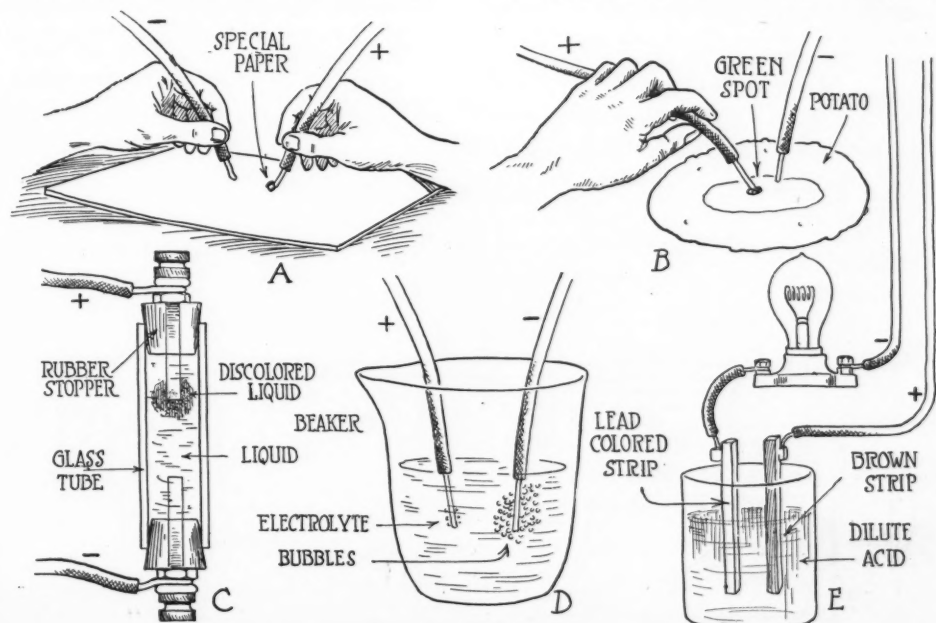


Fig. 3—Some simple ways of finding polarity of charging circuits

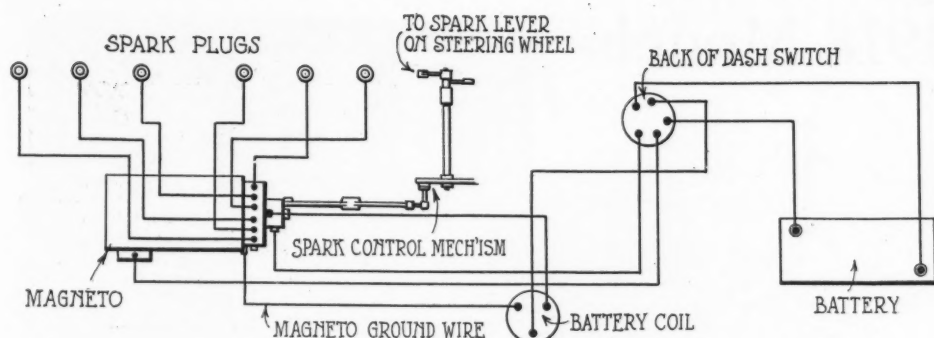


Fig. 6—Wiring diagram of Splitdorf model L magneto

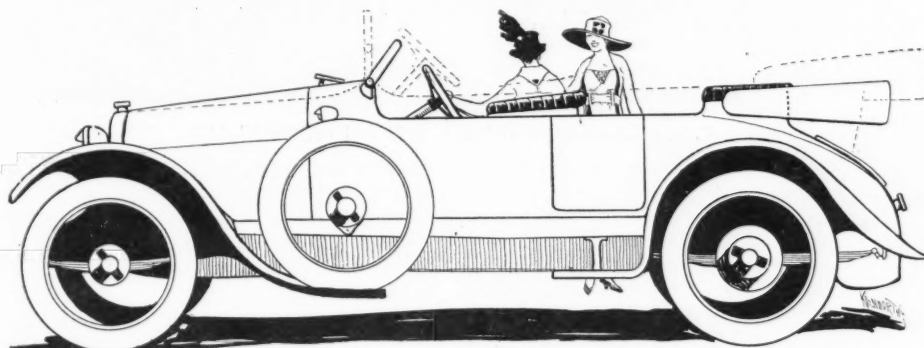


Fig. 7—Suggestion for rebuilding Studebaker into four-passenger speedster

a tendency to cool the reeds rather than to heat them. Heat can only occur by gasoline burning in the carbureter when the engine is not running, a condition that sometimes occurs by bad operation with any make of carbureter, and such occurrence can do harm in one way or another to any make of carbureter.—The Tillotson Mfg. Co.

Driving Gear Adjustment

Q.—How can the roar be taken out of the rear axle of a 45-A Chalmers? It is perfectly quiet while the engine is pulling the car, but when the car turns the engine, as when descending a hill the noise is very loud.—Josiah Fort, Clarksville, Tenn.

This would be termed a coasting noise which would be due to lack of lubrication or to the gear adjustment being too loose. This slackness may be side play in the differential carrier, which can be determined by coasting around a corner and a distinct growl will be noticed due to the ring gear being thrown against the pinion.

To secure proper adjustment of the driving gears it is possible that both the ring gear and the pinion will have to be moved. The pinion should mesh to the full depth of the teeth on the ring gear with just enough play between the teeth so that the pinion shaft can be rotated about $\frac{1}{8}$ in. It would also be well when the differential cover is off of the rear axle housing to see if the ring gear runs true in its mounting.

Dodge Brothers Wheel Data

Q.—What are the dimensions of the wheels on the Dodge Brothers car as to number of spokes, diameter at hub, thickness of spokes at hub, etc.?

2.—What kind and size bearings are used on the wheels of this car?—Fred Rathel, Daleville, Ind.

There are twelve spokes in both the front and rear wheels. The dimensions of the spokes, which are oval, is approximately: $1\frac{1}{8}$ in. by $1\frac{1}{4}$ in. at the felloe and $1\frac{1}{8}$ in. by $1\frac{3}{8}$ in. at the hub.

The bearings used are the Timken roller

bearings made by the Timken Roller Bearing Co., Canton, Ohio, and are as follows:

Name of Part	Timken Part Number
Rear wheel bearing cone.....	288
Rear wheel bearing cup.....	284
Front wheel inner bearing cone....	256
Front wheel inner bearing cup.....	2530
Front wheel outer bearing cone....	1751
Front wheel outer bearing cup.....	1730

Noisy Rear Axle

Q.—I have a 1915 Dodge Brothers car with a noisy rear axle, but it hums when the engine is pulling. Can the whole differential and ring gear be moved into closer contact with the spur gear? Will this lessen the hum? How can this be done?—Josiah Fort, Clarksville, Tenn.

There are adjustments on either side of the differential carrier by which the position of the ring gear can be moved in either direction. Thus the proper adjustment between the ring gear and the pinion can be obtained. The pinion and pinion shaft are mounted in a movable sleeve that can be

moved either in or out as the case may need. The pinion gear and the ring gear should mesh to the full depth of the teeth in order to secure the least noise from the driving gears.

Gears Shift Hard

Q.—I have a 1915 model Dodge Brothers car, which has been run about 5000 miles. The gears are very hard to shift after running a few miles, and at times I have to take my foot to shift the gears. The gears are all in good shape. They have been taken out and put back. The tension on shifting rod springs has also been released, but it does not make them shift more easily.—W. J. Crowley, Golconda, Ariz.

This is probably due to the clutch yoke or release bearing becoming dry on account of the grease tube being blocked. When the yoke become dry in this manner it acts as a brake and stops the clutch the moment it is released thereby making it impossible to disengage the gears in the gearset. The best way to eliminate this trouble is to have a new clutch yoke installed, as after the two flat surfaces comprising the clutch yoke are once burned they will be liable to again give this trouble.

Rebuilding

Rebuilding Studebaker Six

Q.—Give suggestions and diagrams for converting a Series 17 Studebaker Six, seven-passenger touring car into a four-passenger speedster. Wheelbase is 122 in.—R. L. Guerin, Chicago.

In Fig. 7 you will find a suggestion for converting a Series 17 Studebaker into a four-passenger speedster. The dotted lines are those of the old body and you will note that the new body has a slightly higher hood, but the rest of the body is lower than formerly. Also the running boards have been eliminated and the flare of the front fender on the left side provided with a trough for the extra wheel to rest in. The front end of the rear fenders terminates into a very short length of running board and could be covered with an aluminum plate. The gasoline tank is carried on the rear, while immediately above it is a large compartment for carrying purposes. To give the car a touch of smartness the windshield is raked considerably and the steering column set at quite an angle. Little fitment consist of a combined window and ventilator in the top of the cowl and small bullet-shaped side lights.

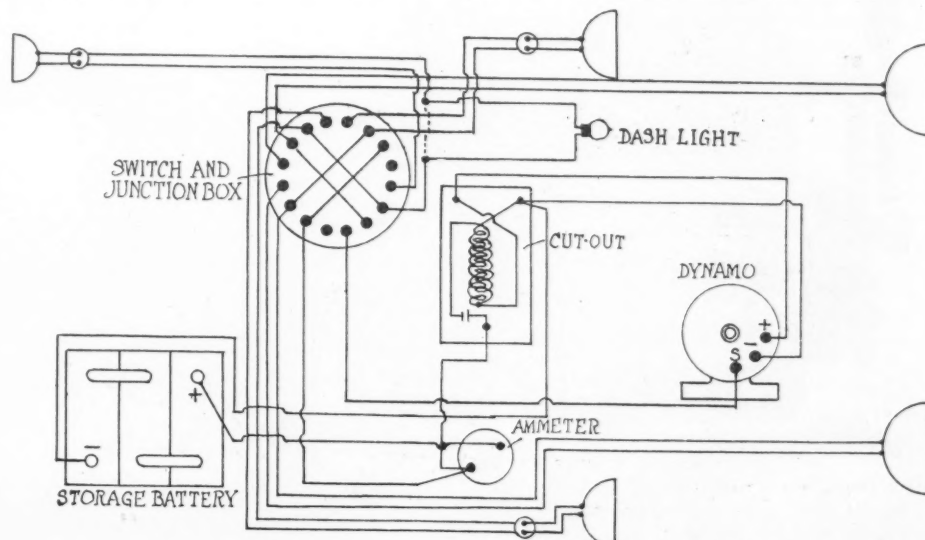


Fig. 8—Wiring diagram of Gray & Davis system on Chalmers

Grant Refines 1918 Models

Five Body Types On Improved Chassis

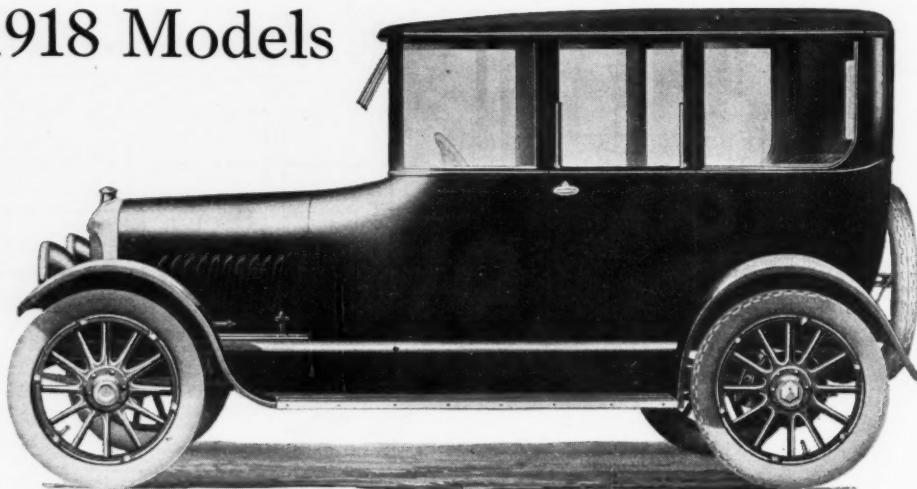
WHILE no radical change has been made in the design of the 1918 model Grant car, in detail each of the changes represents an actual improvement in maintenance and increased sales value. Five distinct body types are mounted on the standard chassis to sell at the following prices: five-passenger touring car, \$1,055; three-passenger roadster, \$1,055; five-passenger detachable sedan, \$1,350; five-passenger all-weather sedan, Springfield type, \$1,595; three-passenger standard all weather coupe, Springfield type, \$1,575.

The design of the engine has been cleaned, benefiting both appearance and ease of maintenance. It is the same size as formerly, six cylinders 3 by 4¼ in., but through the changes may be run at higher speeds, giving increased output. The water-jacket walls at both sides have been carried straight down to the crankcase and the valve lifters at the base are now covered, excluding dirt and grit with attendant wear.

Increased Bearing Surfaces

Practically all the bearing surfaces have been increased in size and the oiling system improved. A V-type fan belt, equipped with a simple adjustment, is used and the fan is driven from the crankshaft instead of the generator. The lubricating system is entirely new. The oil pump capacity has been increased four times and the oil flow is shown by a simple gage, on the dash instead of by the feed oiler heretofore used. Unequal lubrication is rendered more difficult by a new oil trough pan. The Sparks-Withington vacuum tank is attached to the dash instead of to the engine, rendering all parts of the engine head accessible. A Stromberg carbureter is still used with slight changes.

A Willard storage battery still is used, but the capacity has been increased, rendering starting in cold weather much easier. The crankshaft is larger, being now 1½ in. in diameter, balanced at a speed



Grant all-weather sedan which will sell at \$1,595

of 30 m.p.h. and fitted with bronzed back center bearings. The pistons are of new design, having three rings and an increased bearing surface. The Remy automatic-advance type ignition distributor has been removed from the vertical driveshaft and placed upon a short shaft. The spark control mechanism works independently of the timer; the latter as a whole remains stationary. This decreases the possibility of loose wires due to the former constant motion of the timer.

Semi-steel castings replace the heavy drop forge arms formerly supporting the gearbox. These are bolted permanently to the engine and support the gearbox. A pressed steel underpan covers the lower half of the flywheel, effecting complete inclosure. A large hand hole, however, is provided for inspection and adjustment of the clutch and if necessary this steel underpan may be dropped quickly.

The rear axle bearings have been increased in size throughout and the forward end of the propeller shaft now is splined instead of square. A feature that will appeal to all owners is the provision of two jack seats on the rear axle, facilitating the use of the jack and permitting the car to be raised without placing any strain on the truss rods.

Among the changes that give increased

comfort and ease of maintenance is the increase in the wheelbase to 114 in. with an attendant increase in the body and spring dimensions. The rear springs are 8 in. longer than formerly, tending to eliminate bucking or side sway.

An entirely new design of radiator is used, somewhat higher and narrower than that formerly used and of reinforced double-shell construction, permitting ready removal of the core. It is mounted on trunnions, permitting it to adjust itself to any weaving of the car frame. Its cooling capacity has been increased and the shell is nickel plated. The upholstery is French pleated, the material being moleskin, a high grade of imitation leather. Double-decked springs are used. All seats have been given a marked rake by the use of inclined cushion boxes built in the body.

MAKERS HELP RED CROSS

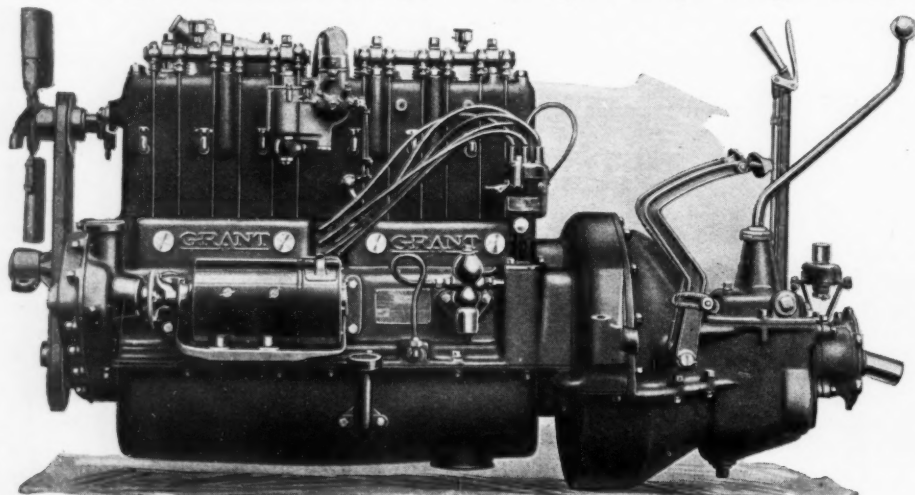
Detroit, Dec. 22—The Red Cross Christmas Membership drive is well under way, and the motor car manufacturers as a whole are responding with fullest co-operation, as they have to every patriotic move made to date. The Ford Motor Co. alone has twenty-five booths and is preparing for an enrollment of 10,000 members, and the Packard Motor Co. is likewise planning to take a similar number. The following are the self-set quotas of the various plants:

Packard Motor Car Co.....	10,000
Ford Motor Co.....	10,000
Dodge Brothers	5,000
Continental Motors Corp.....	2,500
Maxwell Motor Co.....	2,000
Hudson Motor Co.....	2,000
Kelsey Wheel Co.....	2,000
McCord Mfg. Co.....	800

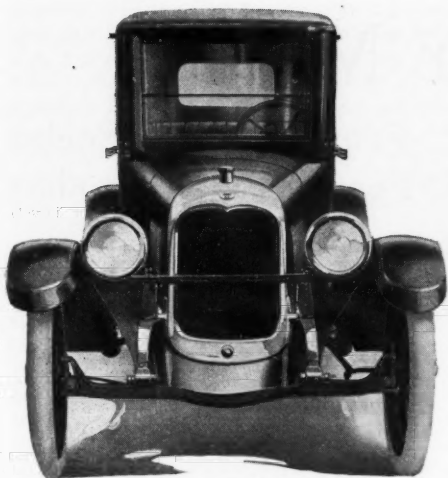
TO SHOW KISSELKAR-SILVERS

The new KisselKar-Silver Special cars, representing the combined efforts of the Kissel Motor Car Co. and C. T. Silver, distributor for Kissel in the New York district, will be exhibited to the public for the first time at the New York show next month. A seven-passenger, five-passenger and four-passenger compose the line of custom-built bodies mounted on a Kissel-Silver chassis, which contains a new Kissel powerplant, with a bore and stroke of 3½ by 5½.

The hood ventilator is placed on the top instead of on each side; the radiator is spe-



Grant 1918 engine, which has been improved



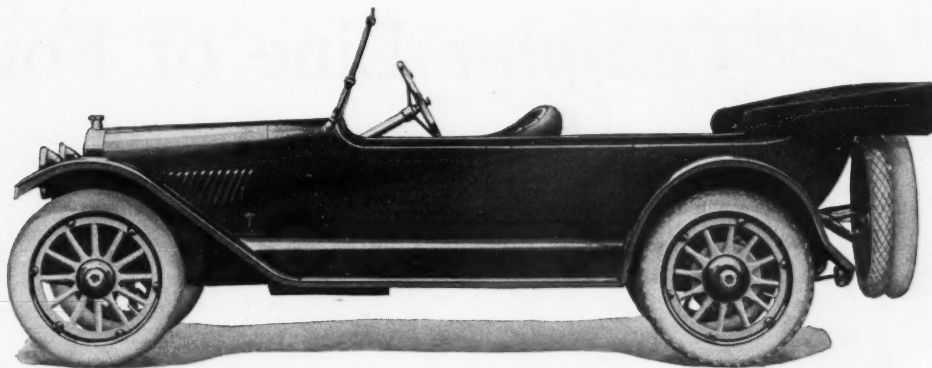
Front view of Grant sedan, showing new type radiator

cially rounded; bullet head lamps and tail lamps are used; and wire wheels with cord tires are furnished as standard equipment with a spare wheel. The doors are unusually wide, the body lines straight, while a roomy body with unusually wide and deep sedan seats combine with special locks, hinges and so on to make for distinctive design. Extra long gearshift and brake levers are fitted.

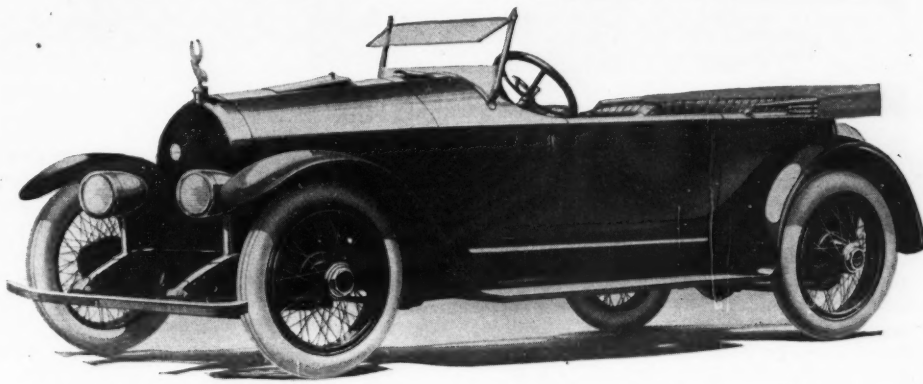
The four cars to be exhibited at New York are: Seven-passenger in maroon color; seven-passenger in gunmetal; four-passenger in blue color combination of special Silver light blue and tapestry upholstery; and a five-passenger staggered door body design in gunmetal combination, all with special leather upholstery and specially designed olive and drab summer top, the five-passenger with a semi-victoria top.

ENTER THE TEXAN CAR

Dallas, Tex., Dec. 21—The Texas Motor Car Association has been organized here with a capital of \$1,000,000 to manufacture the Texan, a two- and five-passenger light car which will sell for about \$850. The factory will be at Fort Worth, Tex., and if the present plans mature, the factory will be in operation in about three months. The schedule calls for about 6000 cars the first year. H. J. Wells of Detroit and F. E. Crotto of Dallas, Tex., are in charge of manufacture. The company is organized



Oldsmobile new four-passenger four-door body on eight-cylinder chassis



Four-passenger KisselKar Silver special to be exhibited at New York

on a co-operative basis and no stockholder can own over \$500 worth of stock. It is expected there will be about 5000 stockholders.

The car will have a four-cylinder in-block engine with detachable heads, a bore of $3\frac{1}{4}$ in. and a stroke of $4\frac{1}{2}$ in., developing 37 hp. at 1800 r.p.m. The multiple-disk clutch and the three-speed gearset are in a unit with the engine. The rear axle is of the full floating type and the wheel size all around is 33 by 4. The electric system is of the two-unit type combining with it the ignition system. The wheelbase is 114 in.

OLDS BRINGS OUT SPORTSTER

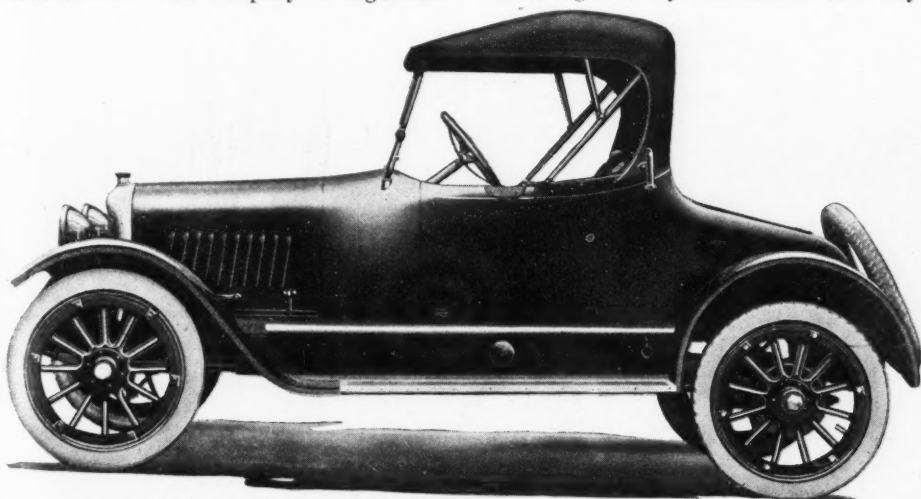
A new four-passenger four-door body mounted on the model 45-A eight-cylinder chassis and known as the Sportster has been brought out by Oldsmobile. The body

is strictly streamline in design, which together with the low mounting on the chassis gives the car a very rakish appearance. The car is offered with the color scheme of azure blue body and wheels with black fenders and aprons. The entire upholstery is French pleated leather with Marshall springs. The engine is of the eight-cylinder V-type with the cone clutch and gearset in one complete unit. Final drive is through a full floating rear axle with a gear reduction of 4.6 to 1. The car is equipped with artillery type wheels using 33 by $4\frac{1}{2}$ tires. The wheelbase is 120 in. The car lists for \$1,550.

REO AND MAXWELL WAR TRUCKS

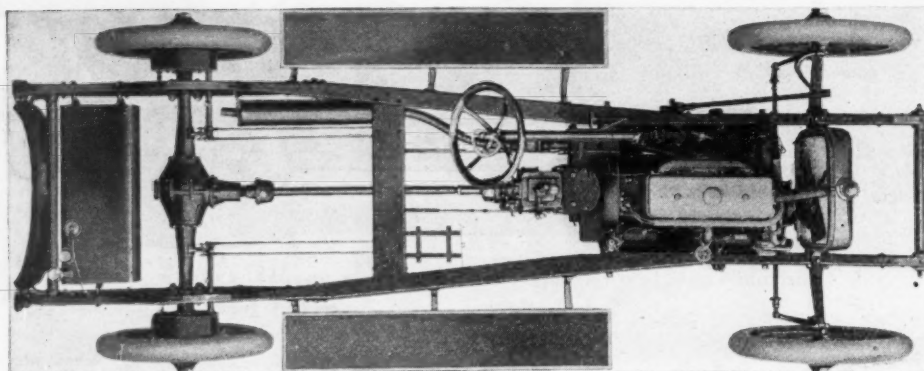
Lansing, Mich., Dec. 22—The Reo Motor Car Co. and the Maxwell Motor Co. have received an order for 6000 creeper trucks to be divided equally between the two concerns. These trucks are of the 5-ton type and are for the Government.

According to R. N. Scott, general manager of Reo, the Reo Motor Car Co. will be obliged to rush its work for the next twelve months both night and day to keep up the manufacture of its own trucks and passenger cars. This order is one of few non-competitive contracts awarded because the two plants were well equipped for the work. The report for the year shows sales of 6494 vehicles in excess of the 1916 sales. There were 30,246 trucks and passenger cars in 1917 as compared with 23,753 in 1916. The company is 2000 cars behind in shipping orders and needs 700 freight cars for immediate shipment. The price of the Reo six-cylinder car will be raised to \$1,550 Dec. 31, an increase of \$165. An entirely new four will be announced at that time to sell for \$1,225. The price of the present four is \$985.



Grant roadster for 1918, which will sell at \$1,055

Templar Line of Four Models



Chassis used by Templar. The wheelbase is 118 in., and turning radius, 40 ft.

THE Templar series, an entirely new line just announced by the Templar Motors Corp., Cleveland, Ohio, is featured by its overhead-valve four-cylinder engine, largely the design of A. M. Dean, who was formerly with the Ferro Machine & Foundry Co., and a Templar product. Four models are offered, a five-passenger and four-passenger touring car at \$1,985 each, a four-passenger Victoria-Elite at \$2,155 and a two-passenger baggage-carrying touring roadster at \$2,255.

Dynamometer tests of the engine show a horsepower curve that is a straight line from 400 to 1800 r.p.m. with a maximum of 43 hp. at 2100 r.p.m. The S. A. E. rating is 18.23 hp. The piston displacement is 196.8 cu. in. and the bore and stroke $3\frac{3}{8}$ by $5\frac{1}{2}$. The valve action is mounted in a detachable head completely inclosed by an aluminum coverplate and operates in an oil vapor rising from the crankcase. The valve rocker shaft is oiled by pressure feed, and the crankshaft is integrally counter-balanced. The crankcase is aluminum, the cylinders gray iron and the pistons cast iron. Camshaft drive is $1\frac{1}{2}$ in. Morse silent chain.

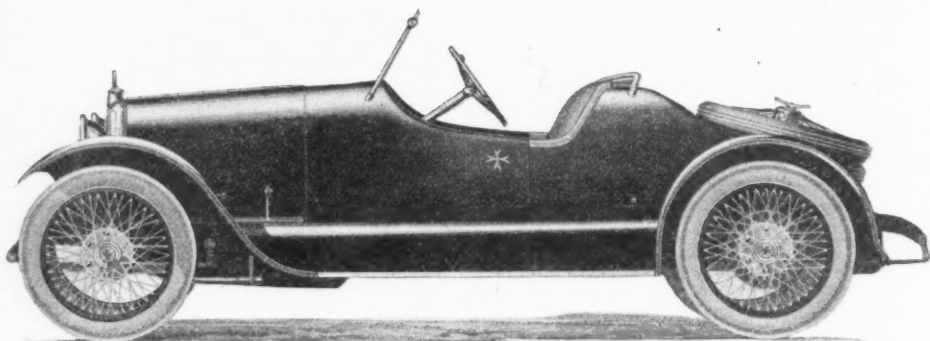
Lubrication is force-fed by gear pump, and water circulation by centrifugal pump through a Fedders' cellular radiator. Fuel is taken from a Stewart-Warner vacuum system 18-gal. supply tank with a 2-gal. reserve carried at the rear. A Zenith carburetor is mounted close to the integrally-cast intake manifold, and the hot air is taken through a large stove surrounding the exhaust pipe, through the cylinder casting directly into the carburetor. The car-

Four-Cylinder Engine Features New Product

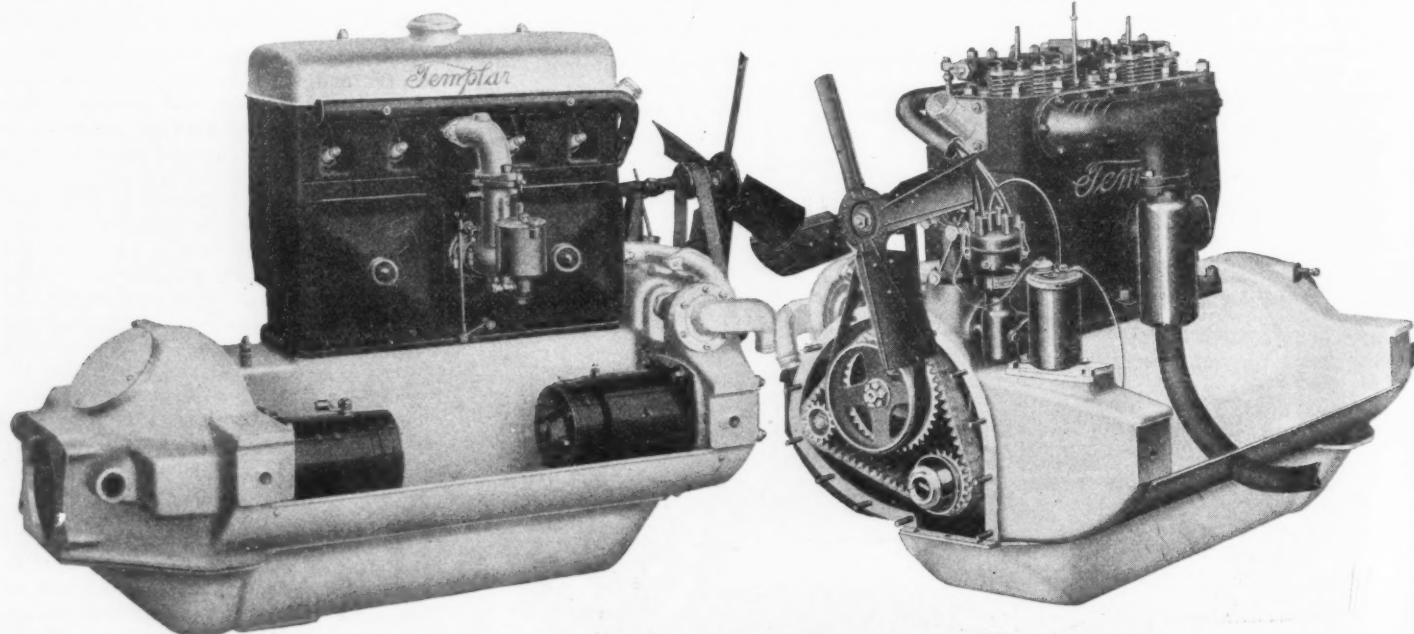
buretor air adjustment is mounted on the steering column.

Starting and lighting is by a Remy two-unit system, and ignition is battery distributor system with combined automatic and manual control. Both service and emergency brakes are internal expanding on the rear brake drums and lined with Thermoid. Jacox steering gear, irreversible screw and nut type, is used. Hotchkiss drive is used, the torque being taken through the rear springs, which are flat under load. A Borg & Beck single dry-plate clutch with multiplying levers is part of the equipment. Transmission is in unit with the engine and of the selective type with sliding gears, three speeds forward and reverse. Wheels are of the artillery type with Parker demountable rims and tires 32 by 4, straight-side Goodyear cord and rib tread in front and non-skid rear.

The 5-in. frame of channel section narrows at the front to provide for short turning and arches over the rear axle to



Two-passenger baggage-carrying Templar touring roadster



Right side and three-quarter front view of Templar engine, a new product which is largely the design of A. M. Dean and which will be used for a line of four models

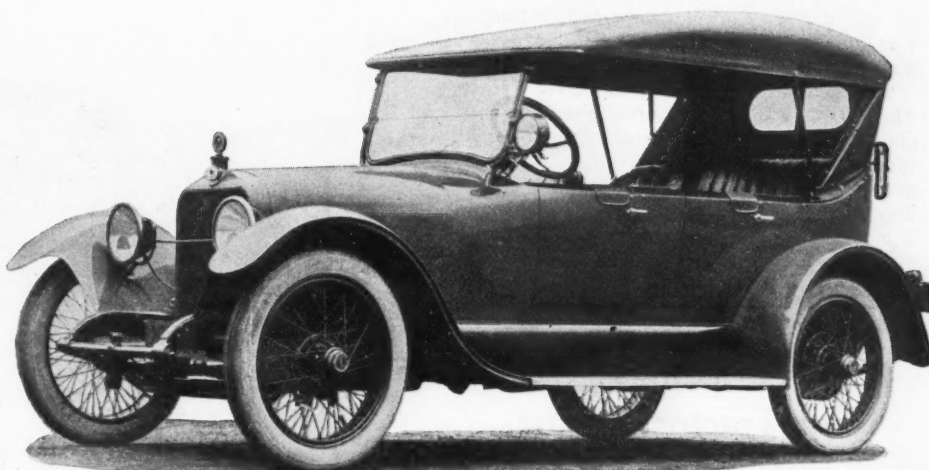
provide full action for underslung rear springs. The front axles are I-beam section made by the American Bearing Co., while the rear axle is semi-floating. Bock bearings are used in the steering spindle, front wheels and differential, while the rear wheels are mounted on SKF bearings and the shafts operate on New Departure ball bearings. The propeller shaft is equipped with two Schwitzer universal joints. The springs are Perfection chrome vanadium semi-elliptic front and rear, 36 by 2 in front and 54 by 2½ in the rear. Springs and shackle bolts are bushed with Nigrum. The bearings are oilless, eliminating the need of grease cups.

The bodies will be custom-built and are long, low-hung and roomy. Standard colors include Tiffany bronze, light wine, Allegheny blue and rich cream. Fenders and splash guards are of black enamel on all models except the touring roadster, on which they match the body color. Hand-buffed leather is used throughout. The curtain equipment is designed with large windows which swing with the doors and includes the Johnston bevel plate glass rear windows.

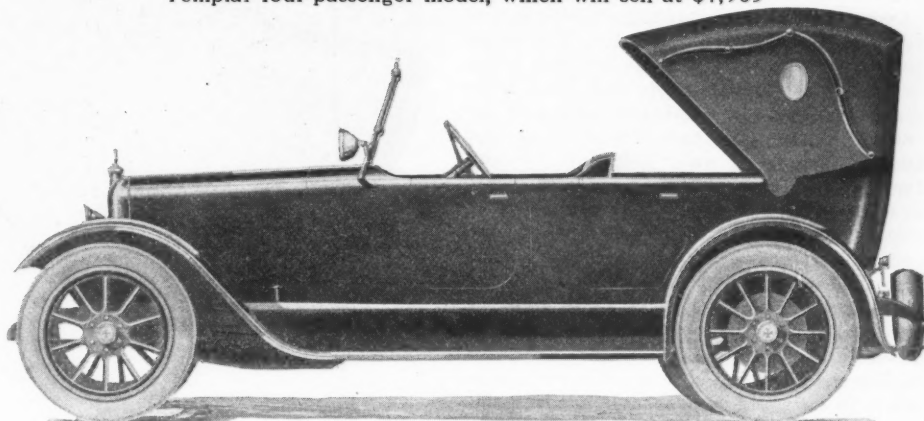
New Hydraulic Device Without Gearshift Lever

A \$1,500,000 corporation, the United States Gear Shift Co., has been formed at Eau Claire, Wis., to manufacture a hydraulic device which eliminates the gearshift lever and can be installed on any car or truck except the Ford. The gearshift is the invention of L. A. Laursen, a hydraulic engineer, and weighs only 16 lb. Brass, aluminum and case-hardened steel will be used in the manufacture, and it is claimed the device can be made at such low cost it can be sold for \$55. Production is expected to start within six weeks.

The gearshift lever is supplanted by a hydraulic gear-shifting mechanism housed in a metal case and mounted under the floor of the car at the rear of the gear-box. The gears are shifted through the action of the clutch pedal by setting an indicator lever mounted on a quadrant just under the steering wheel and then pressing the clutch pedal with the foot to the extreme downward position. The indicator lever is so located that to operate it



Templar four-passenger model, which will sell at \$1,985



Templar, Victoria-Elite, which will sell at \$2,155

does not necessitate the taking of either hand from the steering wheel.

The indicator lever may be set on any desired speed, and by throwing out the clutch and letting it in again the gears are shifted. For example, when traveling on high in traffic the indicator lever may be set for second speed, though the car is running on high. Then, in case of a forced stop, the gears are thrown into second, ready for a quick getaway.

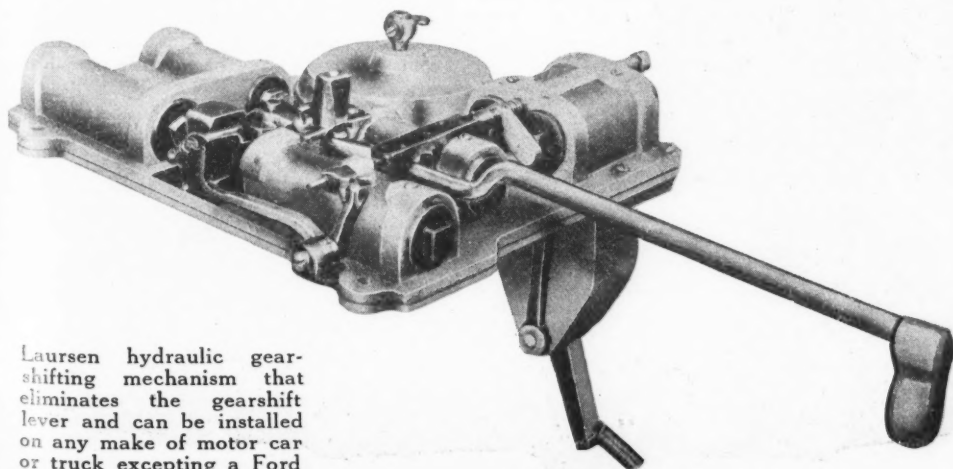
The gears cannot be shifted when the clutch is engaged, as the clutch must be released to shift the gears. This tends to increase the life of the gears, and makes it impossible to strip the gears. The gearshift has been tested thoroughly on a six-cylinder car which has been driven 3500

miles with the device installed on the car.

The different shifts are made by oil pressure obtained by a mechanical connection between the foot pedal on the clutch and an oil-filled cylinder on the shift mechanism. The power cylinder communicates through a master valve with other cylinders on this same base, and by proper combinations of cylinder pressure and cross-head mechanism, the different shifts required are effected.

The master valve is controlled through a linkage leading to a quadrant on the steering post immediately below the gas and spark levers. The different positions of the master valve are indicated by the symbols R, N, L, I and H stamped on this quadrant and read in the order named from the lower left hand corner of the quadrant upward to the right. To effect any shift, the indicator lever is moved to the proper position and the foot clutch pedal pushed down. The last few inches of movement of the pedal shifts the gears. After the gears have been shifted it is impossible to change their relation without first changing the position of the master valve, by moving the indicator on the quadrant. This makes it possible to throw the clutch into or out of contact at will without possibility of changing the gear relations, or meshing of gears while the clutch is engaged.

Mechanical limitations make it impossible to prevent absolutely all oil leakage, hence it is necessary to provide a small reservoir to replace any oil that may escape. On the first machine made, which was necessarily crude from the standpoint



Laursen hydraulic gear-shifting mechanism that eliminates the gearshift lever and can be installed on any make of motor car or truck excepting a Ford

of mechanical workmanship, this leakage was about a pint in a trip of 1546 miles which lasted about a month.

The gearshift is of the selective type. Theoretically it will perform any shift, including those from first, second, and third speeds and neutral directly into reverse gear with the car in motion practically. The shift from any point into reverse gear is made safe by a mechanical device which makes it necessary to open a spring button contact before it is possible to set the master valve in position for the change.

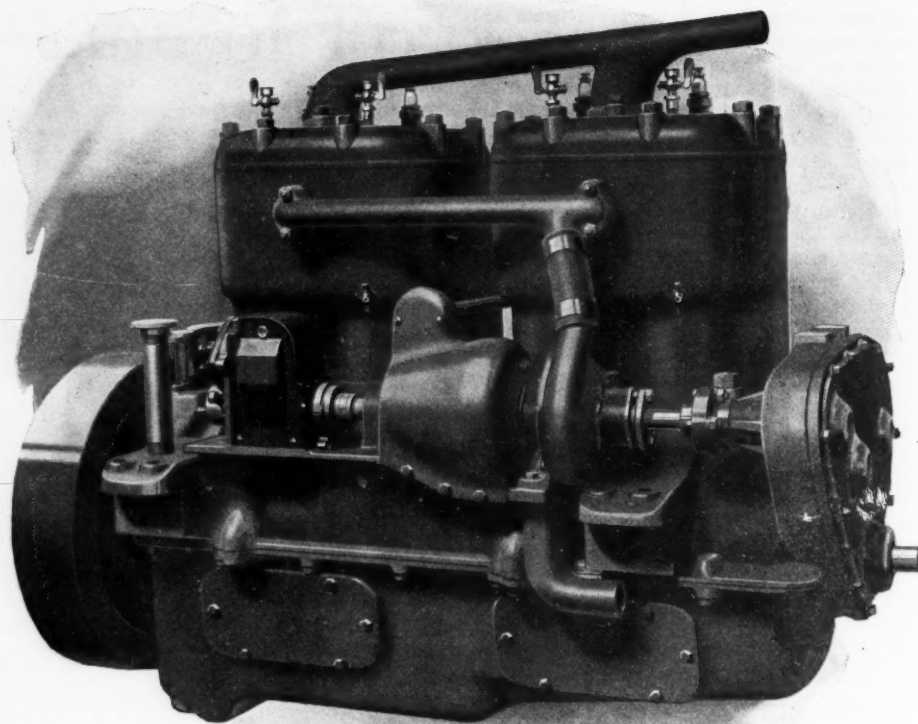
Climax Brings Out New Tractor Engine

THE Climax Engineering Co., Clinton, Iowa, has brought out a four-cylinder L-head kerosene tractor engine with a bore of 5 in. and a stroke of $6\frac{1}{2}$ in. The design is simple and accessible, its features being detachable cylinder heads and hand holes in lower half of crankcase, complete inclosure of all parts and protection against dust, complete waterjacketing around spark plugs and valves, large crankshaft and bearings and a built-in governor. The oiling system is force feed in which the oil is delivered under pressure to all bearings. The inlet and exhaust manifold are cast integral and are designed to give the best possible results when using kerosene as a fuel.

The cylinders are cast in pairs with large waterjackets and demountable heads. Semi-steel pistons are fitted, using three $\frac{1}{4}$ -in. rings. The valves are large and give a free passage of $2\frac{1}{4}$ in. through the ports. Cooling is forced circulation by a centrifugal pump of ample capacity. The bearings are of liberal size to insure long life and are made from suitable bearing materials.

The engine is designed to give its best performance between 600 and 800 r.p.m. with a conservative rating of 34 hp. developed and a maximum output of 40 hp. developed. The weight of the engine is 1050 lb.

The manufacturer is concentrating pro-



Climax tractor engine, with a bore and stroke 5 by $6\frac{1}{2}$

duction on this one model and size of tractor engine and is, therefore, able to build it under favorable conditions.

JONES TO MAKE TRUCKS

The Jones Motor Car Co., Wichita, Kan., has entered the truck field and is bringing out two models, 1-ton and 2-ton. While it is expected that the 2-ton will not be on the market until March 1, delivery on the 1-ton model is to begin Feb. 10.

The light model will sell at \$1,100 and will use a model N Continental engine, four-cylinder with bore and stroke $3\frac{3}{4}$ by 5, and high-tension ignition. Circulation will be by positive gear-driven, centrifugal

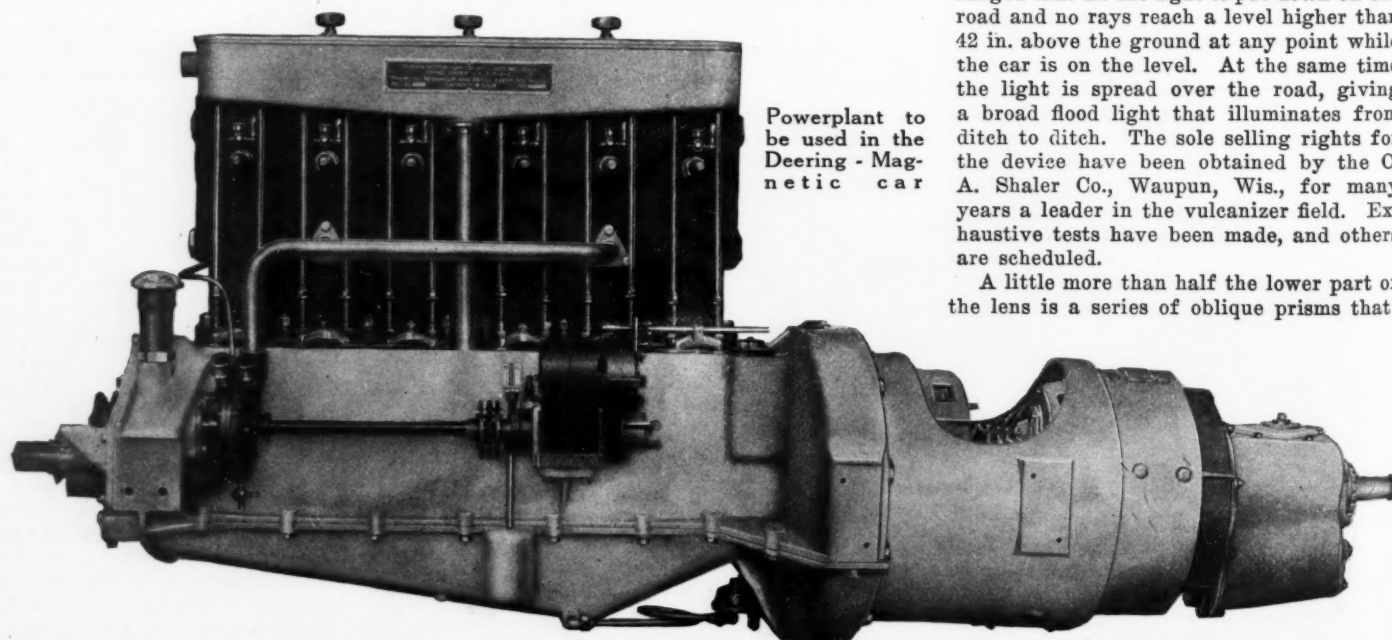
pump and fan mounted on engine. A vertical tube radiator will be fitted. A wheel-base of 130 in., chassis weight of 2750 and solid tires, 34 by $3\frac{1}{2}$ in front and 34 by 4 in rear, are included in the specifications. The truck will have a loading space of 9 ft. and is designed to carry $1\frac{1}{2}$ ft. overhang. The front springs are 44 in. long by 2 in. wide; rear, 52 in. by 3.

A mark of 2000 for the 1918 truck production has been set.

CONSTRUCTION OF SHALER LENS

The Shaler Roadlighter is a lens made of molded optical glass, smooth on front and with a series of prisms on the back, so arranged that all the light is put down on the road and no rays reach a level higher than 42 in. above the ground at any point while the car is on the level. At the same time the light is spread over the road, giving a broad flood light that illuminates from ditch to ditch. The sole selling rights for the device have been obtained by the C. A. Shaler Co., Waupun, Wis., for many years a leader in the vulcanizer field. Exhaustive tests have been made, and others are scheduled.

A little more than half the lower part of the lens is a series of oblique prisms that



Powerplant to be used in the Deering - Magnetic car

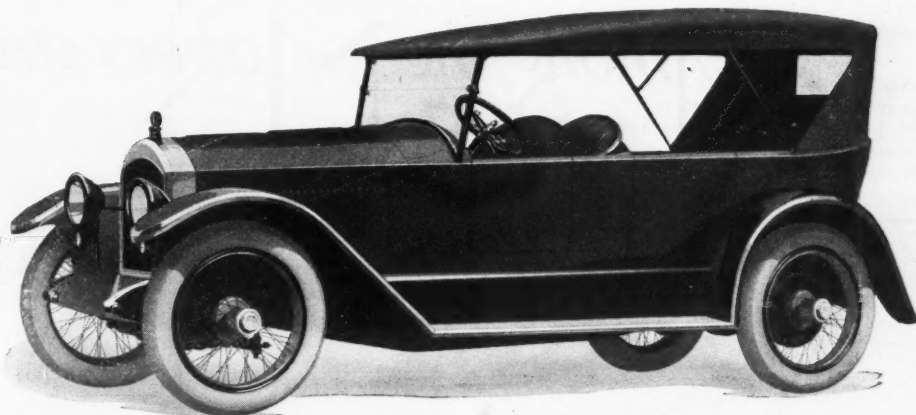
meet in the center of the glass from right to left. In the upper part of the lens are two prisms, one smaller than the other, each beveled so that one gives a strong light for a long distance and the other for intermediate distances, but none of the rays can reach a level higher than 42 in. above the ground. The oblique prisms take the rays from the lower half of the parabola and bend them downward and to the sides of the road, producing the effect of two spotlights, while the two upper lenses illuminate that part of the road directly in front. The smooth glass in front eliminates the catching of dust, since the prisms are on the inside. Any type or style of lamp bulb can be used, and accurate focusing of the bulb is not necessary to produce a good light, it is claimed, since a lamp bulb so out of focus that it gives an extremely black spot with plain glass, when fitted with a Shaler lens, produces good light and the black spot is eliminated. The device works equally well with acetylene lamps. It will sell at \$2.75 a pair for Ford cars and at \$3.50 for all other cars.

Make-Up of New Deering - Magnetic

AS announced in the Dec. 20 issue of **MOTOR AGE**, the Deering Magnetic car will be produced by the Magnetic Motors Corp., Chicago. The chief features of this new car include the Entz electric transmission mounted in a chassis using the Dorris engine. The Dorris engine is of the six-cylinder, valve-in-the-head type, cylinders cast in blocks of three with a 4-in. bore and a 5-in. stroke. The wheelbase of the Deering-Magnetic is 132 in., using Rudge-Whitworth wire wheels fitted with 33 by 5 cord tires.

The Entz transmission eliminates the customary gearset and performs the functions of the electric starter, flywheel, clutch, gearset, clutch pedal, and gearshift lever. A small lever located on the steering wheel serves to start the engine, controls all speeds and operates the electric brake. A full description is given elsewhere in this issue.

On the Dorris engine the rocker beams are housed in an aluminum case with a top which can be easily removed by two knurled screws turned by the hand. This housing also contains the upper water pipe, this taking the water directly from above the exhaust ports. The rocker beams and valves are protected from dust and grit and the engine is made very clean by this housing.



Deering-Magnetic car with Entz transmission and Dorris engine

Arrangement of the admission pipe and the firing of the engine is such that the firing alternates on the first and second set of three cylinders. This makes it possible for the gas to flow continuously and uninterruptedly from the carburetor to the two short manifolds to each set of cylinders and avoids all reversal of flow of gas and lost time, as is consequent when this is arranged otherwise. Owing to the alternate firing of the two sets of three cylinders there is a short period between the closing of one inlet valve and the opening of the next which permits the velocity of the gas to rise to pressure causing a ramming effect the instant the next valve opens, which improves the filling of the next cylinder.

This process is uniform throughout the whole set of six cylinders. The exhaust pipe is partitioned so that the exhaust from the first set of three cylinders cannot blow back and refill the exhausted cylinder of

the second set. This would be the case if this provision was not made, as the exhaust valves then would overlap each other to such an extent that when one valve was approaching the closing point a preceding engine would open up and refill the cylinder with burnt gas and prevent it from receiving a full charge of fresh gas.

Lubrication is by pressure force-feed system with the gear pump and oil gage at the side of crankcase. Ignition is by a Bosch magneto. Lighting and starting is taken care of in the magnetic unit. The rear axle is a full floating Timken with differential and wheels carried on roller bearings, which are adjustable for wear. The final drive is through spiral-bevel gears. The steering is of the worm-and-gear type, adjustable for wear. The rear springs are semi-elliptic, 60 in. long, while the front ones are the same, 42 in. long. The brakes are of the conventional type in addition to the magnetic power brake.

The latest type double-jet Stromberg carburetor is used and steering column control and valve in air horn are furnished to make easy cranking in cold weather. The intake pipe has a very large waterjacket with valves for turning off the hot water if necessary. The Stewart vacuum system is used.

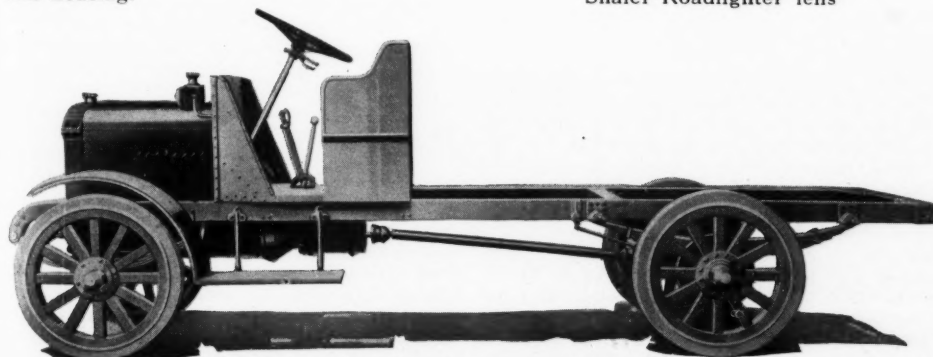
There is a bearing on each side of every crank pin. This gives a crankshaft which eliminates all whip and vibration. The crankshaft is made of special steel proved by service to be most desirable. The bearings are bronze backed and lined with nickel babbitt.

To eliminate all possible vibration and erratic operation of the valves it was found necessary to support the cam at seven points, there being a pair of cams operating between two bearings throughout the entire length of shaft. This is not only an advantage in synchronizing the valve timing but also eliminates springing or whipping of the cam due to the intermittent operation of the valves. This in turn leads to quiet operation and long life.

Upholstering is in black leather. Equipment consists of top and dust cover, rain vision windshield, ventilating top and bottom, 60-mile Warner speedometer with season and adjustable individual trip register, special tire carriers in rear, one extra wire wheel, two 10-in. electric headlights with double bulbs and dimmer, one electric tail light with license carrier, electric horn, electric inspection light, robe rail, foot rest, tool set, jack and tire repair outfit.

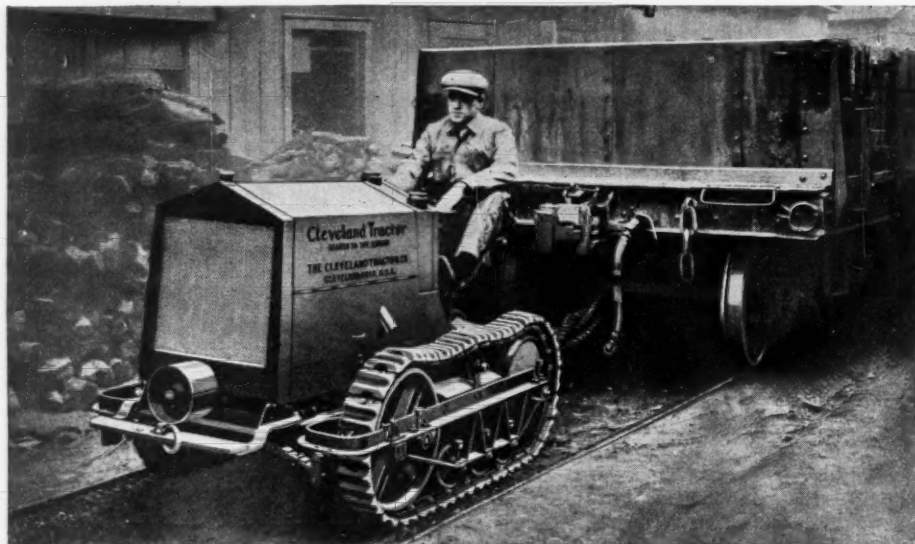


Shaler Roadlighter lens



Jones 1-ton truck, which will sell at \$1,100

Among the Makers and Dealers



CLEVELAND TRACTOR "WORKING ON THE RAILROAD"—The photograph shows a Cleveland tractor being used for spotting cars of ore at the plant of the Enterprise Co., Cleveland, Ohio. A switch engine formerly did this work

CADILLAC Truck Now Acme—The Cadillac Auto Truck Co., Cadillac, Mich., is now styled Acme Motor Truck Co.

Brandimore to Represent Mitchell—Jay C. Brandimore, formerly with the Reo Motor Car Co., has been appointed special factory representative of the Mitchell Motors Co., Inc., Racine, Wis.

Lake Goes to Rich Tool Co.—E. F. Lake, metallurgical engineer, formerly at Detroit, has been assistant superintendent of the Rich Tool Co., Chicago, which is making one-piece valves for airplane and motor car engines.

Porter Rubber Co. Reorganizes—The Porter Rubber Co., Salem, Ohio, has been reorganized with Louis W. Hicks, Pittsburgh, as president and Grant Hill, Salem, as treasurer. A. H. Boyd, Pittsburgh, is re-elected vice-president.

National Wire Wheel Expands—The National Wire Wheel Works, Inc., Geneva, N. Y., has increased its capital from \$350,000 to \$1,000,000. Additional buildings will be erected, and production will be increased to 2,000 wheels daily.

Greenmayer Gets Army Commission—E. D. Greenmayer has been commissioned major in the quartermaster's department to manage a truck factory in France, leaving immediately. He was formerly with the Briscoe Motor Corp. and at one time was superintendent of the Lewis Spring & Axle Co., Chelsea, Mich.

Reo Distributors Consider Situation—About 100 distributors for the Reo Motor Car Co. met at the factory with the sales department to discuss business conditions and interchange ideas. The freight car situation was the one of most pertinent interest, as the shortage is handicapping both manufacturer and dealer. For this reason, and because of the expectation that government control on the railroads will tighten up in January, driveaway plans and methods were discussed, and work started on a more definite driveaway system. The shipping schedule for the period from Jan. 1 to Aug. 1, 1918, also was discussed. The dealers were optimistic as

to the coming year, but stated that one difficulty was in securing competent salesmen and mechanics, though these could be obtained if they were willing to pay the wages asked.

To Manage U. S. Rubber Plantation—The United States Rubber Co. has appointed H. H. Bartlett director of its experimental laboratories in the Dutch Indies and manager of the company's 40,000-acre rubber plantation.

Bearings Co. of America Expands—The Bearings Co. of America has just completed additions to the Sterling universal joint plant at Lancaster, Pa. The building for a mess hall and assembly and recreation for the employees of the Sterling plant also has been completed and formally opened.

Hercules Elects Officers—The Hercules Motor Truck Co., formerly Stegeman Motor Car Co., has elected Adam J. Mayer president and Lynn S. Pease secretary-treasurer. E. M. McLean, formerly advertising manager of the Four Wheel Drive Auto Co., has been appointed sales manager.

Ash Changes Wire Wheel Job—Charles S. Ash, until recently chief engineer and inspector of the Wire Wheel Corp. of America, has accepted a similar position with the National Wire Wheel Works, Inc. Mr. Ash will have complete charge of the engineering and manufacturing work of the company.

Several Thousands at Firestone Meeting—Several thousand stockholders of the Firestone Tire & Rubber Co. attended what was probably the most largely attended meeting of stockholders ever held in the United States. More than 95 per cent of these stockholders were officers and employees of the company. The meeting elected directors of the company for the ensuing fiscal year and transacted other business. The annual report of President H. S. Firestone showed total sales for the fiscal year of \$61,587,219.29, a gain of \$25,585,449.57, or 71 per cent over the previous year and a surplus of \$3,316,395.35 after the payment of dividends, making a total surplus

of \$26,122,824.83, besides subscription to the Liberty Loan of \$500,000. For employees' insurance, old pensions and other welfare work, \$1,100,000 has been set aside.

Wire Wheel Licenses Hill-Smith—The Wire Wheel Corp. of America has granted a license to the Hill-Smith Metal Goods Co., Boston, to manufacture and sell the Minute demountable wheels for Ford cars.

Peterson Now With King—John Peterson has been made factory manager of the King Motor Car Co., Detroit. He was originally with the Peerless Motor Car Co. and later with the Hupp Motor Car Co.

Lane Parker Rust 'Proof G. M.—George Lane has been appointed general manager of the Parker Rust Proof Co. He was formerly sales manager and takes the place of Wyman C. Parker, who is devoting his attention to business in the east.

Black & Decker Completes New Plant—The Black & Decker Mfg. Co., Baltimore, Md., has completed a plant to be devoted exclusively to the manufacture of pumps and drills for English orders on a 40-acre tract of land. Two orders from England call for 1200 machines.

Brooking to Represent Bailey—J. R. Brooking has been appointed western manager, with headquarters at Spokane, Wash., for the George D. Bailey Co., maker of the Bailey ball thrust and Rayfield coupling. Mr. Brooking formerly was with Willys-Overland and Studebaker.

Loomus at Dayton Airplane Plant—Allen Loomus, formerly research engineer of the General Engineering Co., manufacturer of the Doble Steam car, has joined the engineering force at the Dayton airplane factory. Mr. Loomus was appointed to this position at the request of Major J. G. Vincent of the Aircraft Production board.

Iowa Truck Opens Branch—The Iowa Motor Truck Co., Ottumwa, Iowa, has opened a branch at Omaha with H. H. Cannon as representative. The company is making a unit that will fit all makes of cars with transmission amidships, except when the transmission is on the rear axle, in addition to the unit for Ford cars.

Zimmerman With Standard Parts—Thomas Zimmerman will have charge of engineering in connection with axles for the Standard Parts Co. Mr. Zimmerman was formerly employed by the United States Light & Heat Corp., Niagara Falls, and before this was chief engineer of the Standard Roller Bearing Co. and chief engineer of the Abbott Motor Co.

Explosion at Olds Plant—An explosion in the paint department of the Olds Motor Works completely wrecked one building about 100 ft. sq. It was caused by a fender drying oven becoming overloaded with gas. Though many employees were near the site of the explosion only one was burned and injured. The force of the explosion broke the windows for two blocks around the plant.

To Make Puncture-Proof Tire—The Sherman-Stiveson Tire & Rubber Co. has been incorporated at North Scottsdale, Pa., and has purchased the buildings of the F. A. Black Mfg. Co. As soon as the necessary repairs are made and machinery installed, the new company will manufacture a puncture-proof tire made entirely of fabric and rubber, without wire or inner tube. It is

built with a removable tread and can be retreaded and renovated.

Original Duplex Still Going—The original truck made by the Duplex Truck Co., Lansing, Mich., is celebrating its tenth birthday anniversary by making deliveries of freight about the Duplex factory.

Gustin-Bacon Concentrates on Wholesale—The Gustin-Bacon Mfg. Co. has disposed of its retail tire service business at Kansas City, Mo., and will confine its efforts to the wholesale distribution of Miller tires in the terri-

tory of Western Missouri, Kansas and Oklahoma.

Williams Foundry Building Nearly Ready—The new plant of the Williams Foundry & Machine Co., Akron, Ohio, is nearly complete and will be operated early in February, tripling the capacity of the tire repair outfit department. The building is 275 by 40 ft. and three stories high.

Allen Factory Personnel Changes—L. A. Sommers, for three years general factory manager of the Allen Motor Co., Fostoria, Ohio, has been elected assistant general man-

ager. C. L. Allen has resigned his position as production manager to join the Chevrolet Motor Co., of New York.

Sewell Wheel Managers Meet—A get-acquainted meeting was held by the Sewell Cushion Wheel Co. in a convention of its branch managers at the Detroit factory. Progress during the nine years the Sewell wheels have been on the market was reviewed, showing an increase in gross sales from \$1,000 in 1909, the second year, to an estimated three-quarters of a million for 1917.

Akron, Ohio—Akron Seamless Rubber Tube Co.; capital stock, \$100,000; incorporators, Albert Bleeker and W. V. Smith.

Akron, Ohio—Edwards Rubber Co.; capital stock, \$10,000; incorporators, E. W. Edwards and J. W. Rock.

Anderson, Ind.—Kant Freeze Radiator Co.; capital stock, \$20,000; to manufacture motor car radiator equipment; incorporators, Allen C. Shimmer, William J. Norton and Charles T. Norton.

Ardmore, Okla.—Southern Motor Co.; capital stock, \$25,000; incorporators, S. W. Tyer, Roy L. Beeds and Gillie O. Tyor.

Athens, Ohio—Athens County Buick Co.; capital stock, \$10,000; incorporators, C. M. Gill, Frank W. Cone, Fawne M. Cone, Blanche Wells and A. B. Wells.

Akron, Ohio—Akron Motor Signal Co.; capital stock, \$5,000; incorporators, Joseph C. Zuendel, O. C. Castle, Miriam Hassler and Gordon Davis.

Cincinnati, Ohio—Armstrong-Sinclair Co.; capital stock, \$5,000; to manufacture oxy-acetylene equipment; incorporators, C. J. Reeve and G. D. Armstrong.

Cleveland, Ohio—American Auto Alarm Co.; capital stock, \$250,000; incorporators, Howard F. Burns, D. K. Henderson, Herbert A. Spring, L. A. O'Neill and K. G. Kramer.

Cleveland, Ohio—Auto Tractor Sales Co.; capital stock, \$10,000; to deal in motor trucks; incorporators, H. M. Stowe, T. R. Haycox, R. L. Palmer, H. J. Palmer and J. W. Diddam.

Cleveland, Ohio—Best Rubber Co.; capital stock, \$10,000; incorporators, Henry Merket, W. J. Martin, Wm. W. Taylor, Edward Hoblay and G. B. Goetzfried.

Cleveland, Ohio—Cleveland Gear Grinding Co.; capital stock, \$350,000; incorporators, Roy M. Hall and M. E. Noyes.

Cleveland, Ohio—Cuyahoga Tractor Sales Co.; capital stock, \$5,000; incorporators, Louis R. Schlundt, Otto Schlitt, Lucius R. Landfear, Blanche C. Roberts and I. B. Rush.

Cleveland, Ohio—Elcar Motor Sales Co.; capital stock, \$10,000; incorporators, William L. Cole, M. McIntyre, E. C. Jefferies, John W. Albaugh and E. B. Ney.

Cleveland, Ohio—Electric Motor Co.; capital stock, \$25,000; incorporators, George R. Brown, W. K. Stanley, Samuel Horwitz, M. A. Friedman and Fred J. Young.

Cleveland, Ohio—Davie Tool Co.; capital stock, \$50,000; incorporators, J. H. Grayson and George L. Grayson.

Recent Incorporations

Cleveland, Ohio—Firestone Oil Co.; capital stock, \$300,000; incorporators, Charles M. Buse, L. A. M. Pejoau, H. E. Brothers, A. E. Clevenger and S. H. Greensted.

Cleveland, Ohio—Grant-Demno Sales Co.; capital stock, \$10,000; incorporators, Carl F. Shuler, C. E. Curphey, Catherine Murnan, Louise Griffiths and V. P. Reiber.

Cleveland, Ohio—Iler Foundry & Mfg. Co.; capital stock, \$30,000; incorporators, F. M. Iler and Elmer E. Cordrey.

Cleveland, Ohio—Paxson Rim Co.; capital stock, \$50,000; incorporators, C. D. Paxson, H. C. Quigley, Fred C. Wood, P. D. Quigley and J. A. Krieger.

Cleveland, Ohio—Service Auto Storage Co.; capital stock, \$500,000; incorporators, A. M. Gordon, Joseph Newman, Irwin Harris, Henry A. Beckerman and S. M. Davis.

Cleveland, Ohio—Standard Auto Lock Co.; capital stock, \$10,000; to manufacture motor car locks; incorporators, J. A. Watterson, Edward G. Russell, I. S. Payton, G. W. Johnston and C. C. Marshall.

Cleveland, Ohio—Star Auto Repair Co.; capital stock, \$10,000; incorporators, Paul W. Stanley, A. R. Zanoli, M. Himmelbaum, Gezir G. Hussar and Helen Houdek.

Clinton, Okla.—Burke Motor Co.; capital stock, \$10,000; incorporators, W. T. Burke, A. J. Welch and F. M. McBurney.

Columbus, Ohio—Ohio Elcar Co.; capital stock, \$10,000; incorporators, Dorsey W. Short, Herbert W. Hudson, D. P. Hudson, Herbert M. Myers and C. E. Cromley.

Dayton, Ohio—Premier Rubber & Insulation Co.; capital stock, \$100,000; incorporators, Henry M. Granzow and William Grieser.

Dayton, Ohio—Stutz Motor Mart Co.; capital stock, \$10,000; incorporators, W. J. Walsh, Irvin C. Delscamp, H. B. Solimano, I. Thomas Brusk and John Eagan.

Detroit—Detroit Motor Governor Corp.; capital stock, \$25,000; incorporators, C. A. Redmond, B. L. Kibride and Edwin C. Lewis.

Detroit—Super Spark Co.; capital stock, \$5,000; incorporators, B. F. Dickinson, B. F. Cilnes and Howard Streeter.

Detroit—Manufacturers' Clearing House Association; capital stock, \$10,000; incorporators, Joseph H. Austin, J. C. Walker and J. E. Richards.

Detroit—Gairing & Needham Tool Co.; capital stock, \$25,000; incorporators, Emil Gairing, Mae Needham and G. A. Needham.

Denver, Col.—Hough-McRae Motor Co.; capital stock, \$10,000; incorporators, P. R. Hough and A. K. McRae.

Fueblo, Col.—Clark-Black Overland Co.; capital stock, \$25,000; incorporators, George A. Clark and George W. Black.

Detroit—Sherwood Gilmore Motor Co.; capital stock, \$65,000; incorporators, George Gilmore, Nathan E. Sherwood and C. O. Reickard.

Emporia, Kan.—Dale Hollister Motor Co.; capital stock, \$10,000; incorporators, F. J. Dalo, E. M. Hollister and L. O. Dale.

Green Bay, Wis.—Kant-Mis Spark Plug Co.; capital stock, \$10,000; to manufacture and deal in spark plugs and other motor car accessories and supplies; incorporators, William C. Haslem, Berl E. Colburn and Jack Gilleaume.

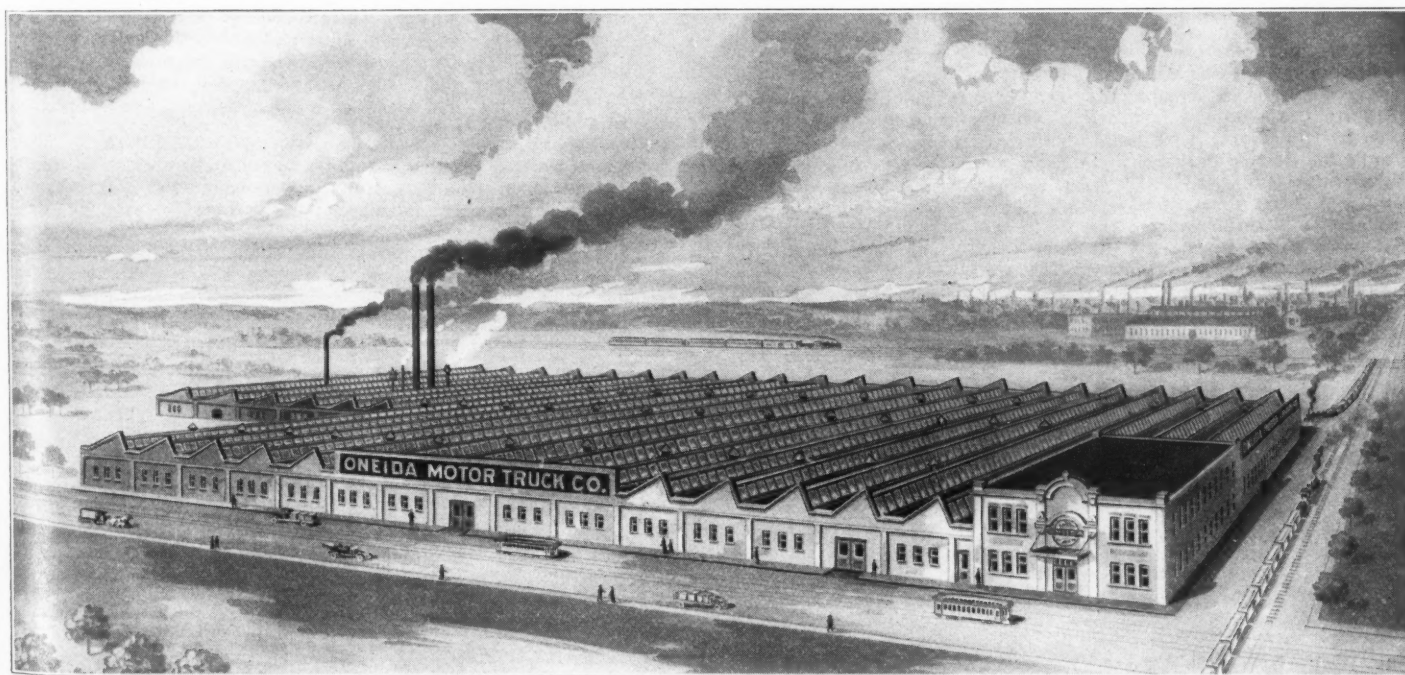
Hamilton, Ohio—Dixie Highway Sales Co.; capital stock, \$10,000; incorporators, John Bixel, Halla Bixel, Russel Bixel, Alice Bixel and Menno Bixel.

Jellico, Tenn.—Jellico Garage Co.; capital stock, \$10,000; incorporators, J. L. Slusher, T. H. King, T. L. Gorman, J. T. Moore and K. Everett Smith.

LaCrosse, Wis.—Rybold-Weihaupt Automobile Co.; capital stock, \$25,000; incorporators, Martin W. Rybold, John G. Weihaupt and Joseph S. Arenz.

Marion, Ohio—Marion Buick Co.; capital stock, \$25,000; incorporators, W. J. Patterson, G. M. Gallagher, Frank W. Caldwell, F. H. Crew and M. A. Marquardt.

Mission, Texas—Gill-Wood Garage Co.; capital stock, \$6,000; incorporators, T. G. Gill, D. G. Gill, D. G. Wood and R. E. Yowell.



ONEIDA TRUCK EXPANDS INTO NEW PLANT—Since its organization the Oneida Motor Truck Co. has been operating in leased quarters at Green Bay, Wis., but the business has grown to such an extent the building shown here was constructed. Occupation will be taken about the first

From the Four Winds



GOING TO SCHOOL TO BECOME MECHANICS—This is a scene from the St. Louis school fostered by the dealers' association, where mechanics are trained

MORE Cars Than Watches—The assessment returns of Madison County, Illinois, a wealthy suburban county, show there are in that county 2211 sewing machines, 2359 watches and clocks and 2534 motor cars.

Texas Farmers Truck to Market—Because of congested freight conditions in Texas, farmers and stock raisers are hauling their produce and cattle to market in motor trains. The first train passed through Dallas from Farmersville and contained five trucks loaded with sheep and hogs for delivery at the Fort Worth stock yards. The 57 miles was made in 7 hr. at less cost than freight.

Burlington Trail Now Mayo—Application has been made with the Minnesota state highway commission to register the trail from the Twin Cities to Glacier park, the route taken by the last A. A. A. tour. The mark is to be the Glacier Park goat. In Minnesota it passes through Hennepin, Wright, Meeker, Kandiyohi, Swift, Pope, Stevens, Grant, Traverse and Wilkins counties. The Burlington trail name has been changed to Mayo trail, in honor of the Mayo surgeons. The trail leads from the Iowa line through Fillmore, Goodhue, Olmsted and Dakota counties to St.

Paul and Minneapolis. More than \$300,000 is to be spent in improvement of the trail in 1918, of which \$90,000 will be spent in Goodhue county alone.

A Car From Scrapped Machinery—During his spare hours in the winter of 1916-17, Wellington Potter of Regent, Man., built a motor car out of material collected from scrapped farm machinery. Practically all the work was done by Mr. Potter himself and very little cash was expended for raw material. For power he uses a second-hand 4-hp. two-cycle marine engine, connected to the transmission by an internal expanding clutch operated by a foot pedal. The transmission consists of the gearing from an old two-speed mower, which gives two forward speeds of about eight and twelve miles per hour at 800 r.p.m. of the engine. The gears run in oil and are operated by a hand lever. The rear axle is gear driven, and each rear wheel is fitted with a ratchet, so that a differential is not necessary. Ordinary buggy wheels which have been cut down to 35 in. are used. The engine is cooled by water, circulated by a pump through a tank mounted behind the seat. The battery and gasoline tank are under the seat. The dash equipment con-

sists of throttle and spark control, ignition switch, needle valve adjustment and exhaust cut-out.

No Special Train for These—Believing it would be unpatriotic to charter a special train for the New York and Chicago motor car shows, the Dallas Automobile and Accessory Dealers' Association this week decided to abandon plans for this year's trip. The dealers have been considering chartering the special train for several weeks.

Maxwell Makes Record in B. S. A.—The latest record attained by a Maxwell was for gasoline economy in South Africa, which was made between Johannesburg and Pretoria, 36 miles, with a mark of 44.9 miles on a gallon. A 1-gal. tank, sealed by the municipal department of weights and measures, was used.

Ohio Wants Tags for War Stamps—The Columbus, Ohio, motor car registrar is conducting a campaign for the recovery of all license tags of 1917 and previous years. It is believed possible to recover 200,000 tags, totaling 100 tons of scrap metal, these to be sold and the proceeds invested by the state in war savings stamps. It is expected that \$2,000 can be raised in this manner.

Overland Harvested Rice Crop—After five years in service over the mud roads around Crosby, Tex., an Overland car harvested the rice crop of a concern at Crosby. It was hitched to a cutter and cut a swath back and forth across the 9000-acre stretch of rice that previously required three cutters with eight mules each. The cutter was speeded up by a gasoline engine so that from 8 to 12 m.p.h. was the steady gait of the outfit. It cost a little more than \$1 a day to run the car.

Arizona County Votes Million for Roads—By a vote of five to one, Cochise county, Arizona, taxpayers have approved a bond issue of \$1,000,000 for the construction of a county highway system. Work on the first section, which will consist of a concrete highway from Douglas to Bisbee, will begin shortly after the first of the year. The concrete highway will be 27 miles long and will cost approximately \$618,000.

Cross-Country in November—With the mud and dirt of eleven states on his inclosed Franklin brougham Samuel J. Keeler of Norwalk, Conn., recently drove into Tulsa, Okla., 1757 miles from home, after being on the road 74 hr. 25 min., an average of 23.5 m.p.h. for November cross-country motoring. He reported a gasoline mileage of 17.06 m.p.g.

MEETINGS

- Jan. 7-8—New York, National Automobile Dealers' Association, board of directors and eastern vice-presidents' meeting.
- Jan. 8—New York, N. A. C. C., meeting of motor truck makers.
- Jan. 10—New York, S. A. E., Automotive dinner at Hotel Biltmore.
- Jan. 11-16—New York, National Association of Automobile Accessory Jobbers' convention.
- Feb. 1—Chicago, S. A. E., War dinner at Hotel Harrison.

SHOWS

- Jan. 5-12—New York.
- Jan. 9-27—Cleveland, Ohio.
- Jan. 11-18—Washington, D. C.
- Jan. 11-19—Providence, R. I.
- Jan. 14-19—Rochester, N. Y.
- Jan. 16-25—Milwaukee, Wis.
- Jan. 19-26—Montreal, Canada.

Coming Motor Events

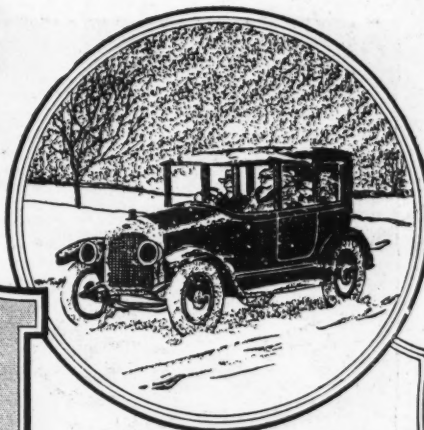
- Jan. 19-26—Detroit.
- Jan. 19-27—Cleveland, Ohio.
- Jan. 21-26—Scranton, Pa.
- Jan. 21-26—York, Pa.
- Jan. 21-26—Portland, Ore.
- Jan. 21-28—Wilmington, Del.
- Jan. 22-25—Oklahoma City, Okla.
- Jan. 22-26—Baltimore, Md.
- Jan. 26-Feb. 2—Chicago.
- Jan. 26-Feb. 2—Harrisburg, Pa.

- Jan. 26-Feb. 2—Columbus, Ohio.
- Feb. 2-9—Minneapolis, Minn.
- Feb. 5-9—Binghamton, N. Y.
- Feb. 9-16—Kansas City, Mo.
- Feb. 11-16—Kansas City, Mo.
- Feb. 11-16—St. Louis, Mo.
- Feb. 11-17—Toledo, Ohio.
- Feb. 16-24—San Francisco, Cal.
- Feb. 18-23—Syracuse, N. Y.
- Feb. 18-23—Grand Rapids, Mich.
- Feb. 18-23—Springfield, Ohio.
- Feb. 18-23—Des Moines, Iowa.
- Feb. 18-25—Pittsfield, Mass.
- Feb. 18-27—South Bethlehem, Pa.
- Feb. 20-23—Quincy, Ill.
- Feb. 20-23—Des Moines, Iowa.
- Feb. 22-March 2—Salt Lake City, Utah.
- Feb. 25-March 2—Muskegon, Mich.
- Feb. 26-March 3—Omaha, Neb.
- March 2-9—Boston, Mass.
- March 6-9—Clinton, Iowa.
- March 6-9—Sioux Falls, S. D.
- March 16-20—Great Falls, Mont.
- March 20-23—Trenton, N. J.
- April 9-13—Stockton, Cal.

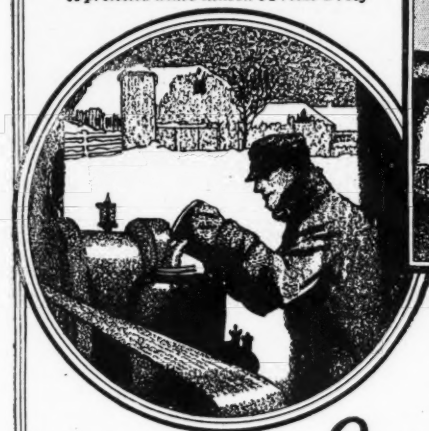
JOHNSON'S FREEZE-PROOF



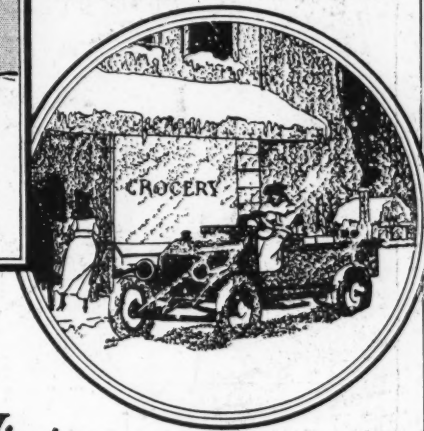
This truck driver fears neither the cold days nor the cold nights for his radiator is protected with Johnson's Freeze-Proof



Don't spoil the pleasure of winter driving in constant worry. Use Johnson's Freeze-Proof in the radiator and it can't freeze.



This farmer has Johnson's Freeze-Proof in the water jacket enabling him to use his engine all winter.



This delivery man lets his truck stand around as long as he pleases, it's protected with Freeze-Proof.

One Application Lasts All Winter

Prevents Frozen Radiators

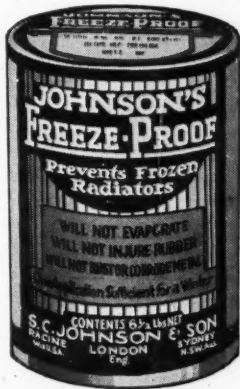
THE only way you can be positive that your radiator won't freeze up in winter is to use a non-evaporating, anti-freeze preparation. The present high price of Alcohol—its low boiling point—and quick evaporation make it impractical. Besides, you are asked to conserve the supply of Alcohol for use in explosives.

Does Not Evaporate

Johnson's Freeze-Proof does not evaporate so one application is sufficient for the whole winter unless the solution is weakened by leakage of the radiator or hose connections, thru the overflow pipe, or by boiling over.

Johnson's Freeze-Proof is put up in packages containing 6½ lbs. net which retail at \$1.50 each in U. S. A. One package will protect a Ford from freezing at 5° below zero. For larger cars use two packages to protect to 5° below zero, and three packages to protect to 20° below zero.

S. C. JOHNSON & SON, Dept.



Johnson's Freeze-Proof should be used wherever you wish to prevent water from freezing—in automobiles, gas engines, tractors, electro-lighting and heating plants, traction companies, etc. One box will prevent 3½ gals. of water from freezing at 5° below zero. For lower temperatures increase the proportion of Freeze-Proof.

Absolutely Harmless

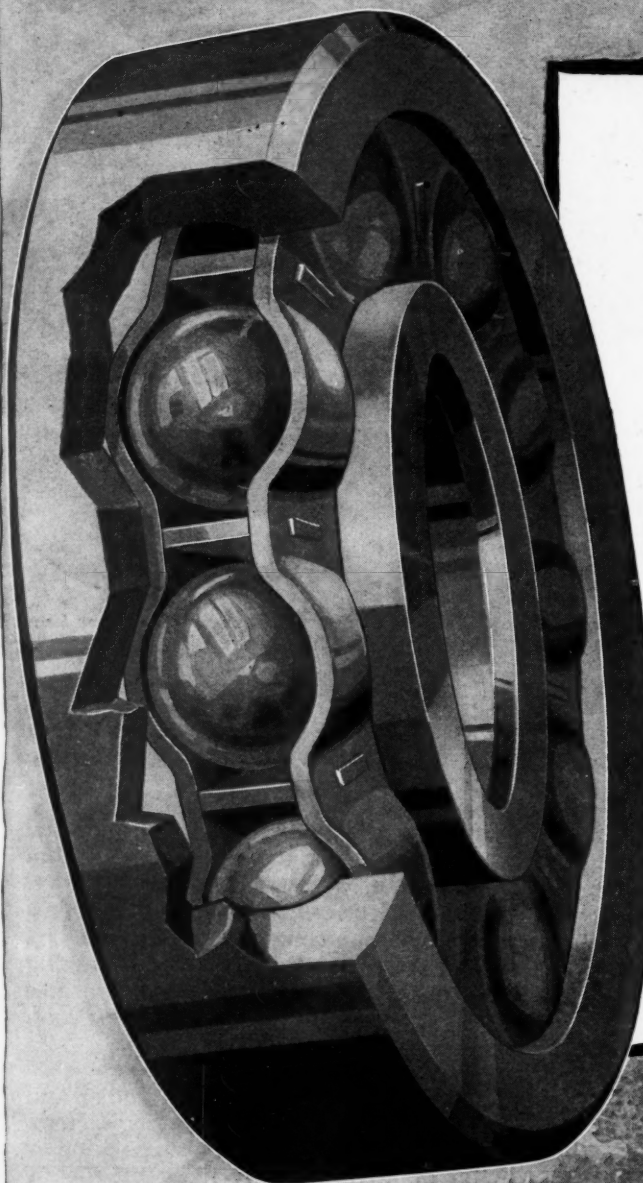
Johnson's Freeze-Proof contains no oil and does not interfere with the cooling system. It will not injure rubber, cloth, packing or metal of any kind. It does not rust or corrode any metal. Johnson's Freeze-Proof is economical and easy to use and it raises the boiling point of water 12° to 25°. Write for our new booklet entitled "Keep Your Car Young". We will send it to you free and postpaid. The information in this booklet will enable you to greatly improve the appearance and performance of your car.

MA RACINE, WIS., U. S. A.



When Writing to Advertisers, Please Mention Motor Age

STURDINESS



THERE is a hardy, robust quality about motor vehicles mounted on New Departure Ball Bearings that is thoroughly consistent with modern requirements.

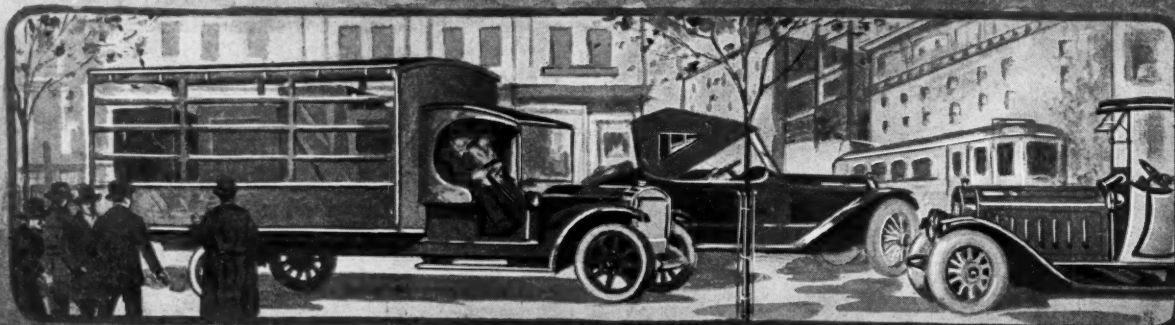
Experience has taught that New Departures are *powerful* in their defeat of friction evils—*stubborn* in their resistance to wear—*firm* in their reliability.

New Departures endure, because not only are they rugged in design, material and construction, but they are *engineered* into your chasses—backed by the experience of experts.

Engineering consultation service free and confidential. Unusually helpful data sheets upon request.

THE NEW DEPARTURE MFG. COMPANY, Bristol, Conn.
Conrad Patent Licensees.

NEW DEPARTURE
BALL BEARINGS



When Writing to Advertisers, Please Mention Motor Age

Ross Gears

WHITE with age, but with a heart still young and body unwearied, Nineteen Seventeen comes to the end of his task, and, with eager confidence, Nineteen Eighteen takes the wheel. He knows that the Ross Steering Gear which made last year's labor lighter will likewise make it easy for him to steer the old world for the twelve months to come.

*The Steering Gears that Predominate
on Motor Trucks*

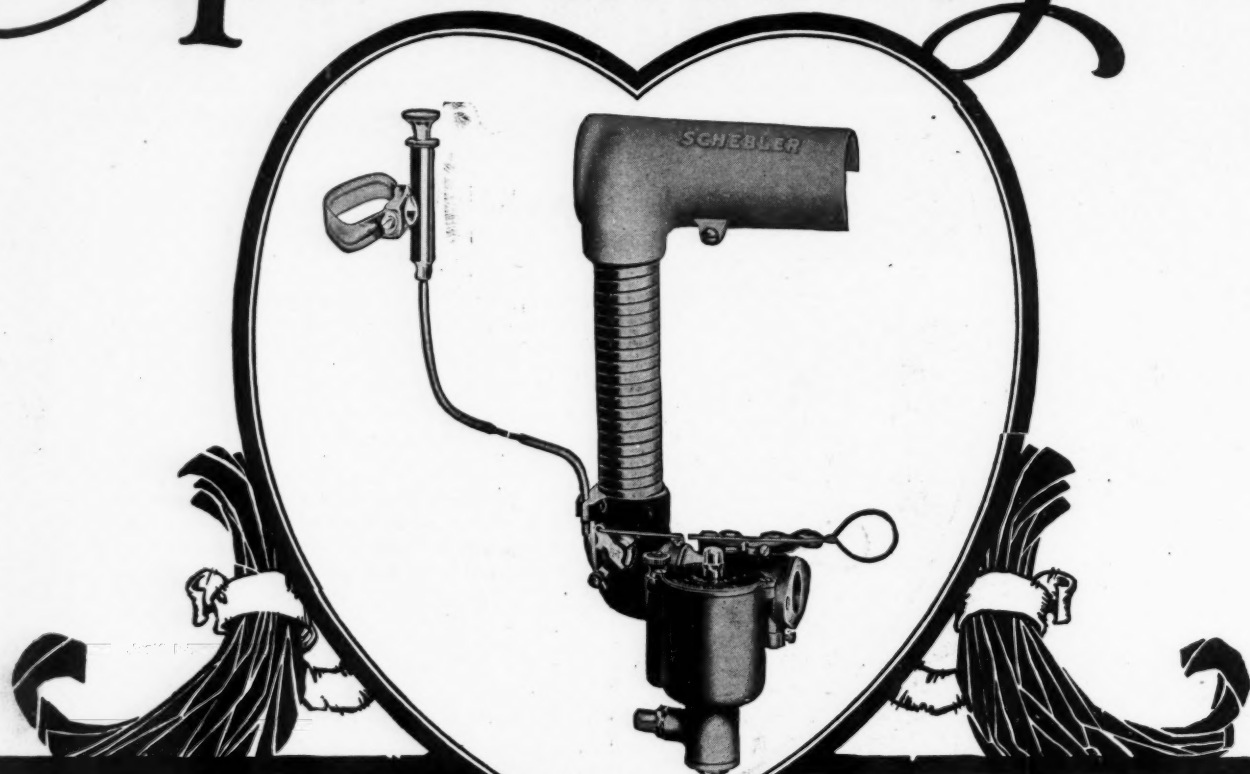
have won this high place by the easy steering, safety and reliability which are guaranteed by ROSS design, and by the highest quality in materials and workmanship. One hundred and fifteen motor truck manufacturers, representing considerably over half the entire industry, use ROSS GEARS as standard steering equipment.

*Write for new catalog and any special
information desired*

Ross Gear & Tool Company
400 Heath Street Lafayette, Indiana



Announcing



SCHEBLER VALVELESS CARBURETOR *for FORD CARS*

NO MOVING PARTS BUT THE THROTTLE
—BUILT ON SCIENTIFIC PRINCIPLES—
DEVELOPS THE MAXIMUM POWER OF THE
MOTOR—USES MINIMUM FUEL—WE DO NOT
CLAIM THIS CARBURETOR "IS AS GOOD."
WE GUARANTEE ITS SUPERIORITY TO ANY
OTHER CARBURETOR MANUFACTURED.

Write for prices and full particulars.

WHEELER-SCHEBLER CARBURETOR CO., Inc.
INDIANAPOLIS, U. S. A.

STEPHENS

Salient Six

Equilibrium

BALANCE of weight and correct apportionment of power to load is worked out with as fine detail in the Stephens car as it is in the modern airplane.

The Stephens "floats evenly" because its weight is scientifically distributed on its springs. It has ample power for every emergency because its small engine is highly efficient, the perfected overhead-valve engine which burns ALL the gasoline. Bore $3\frac{1}{4}$ inches; stroke $4\frac{1}{2}$ inches. Fourteen to eighteen miles on a gallon of gasoline with an actual fifty-seven horsepower.

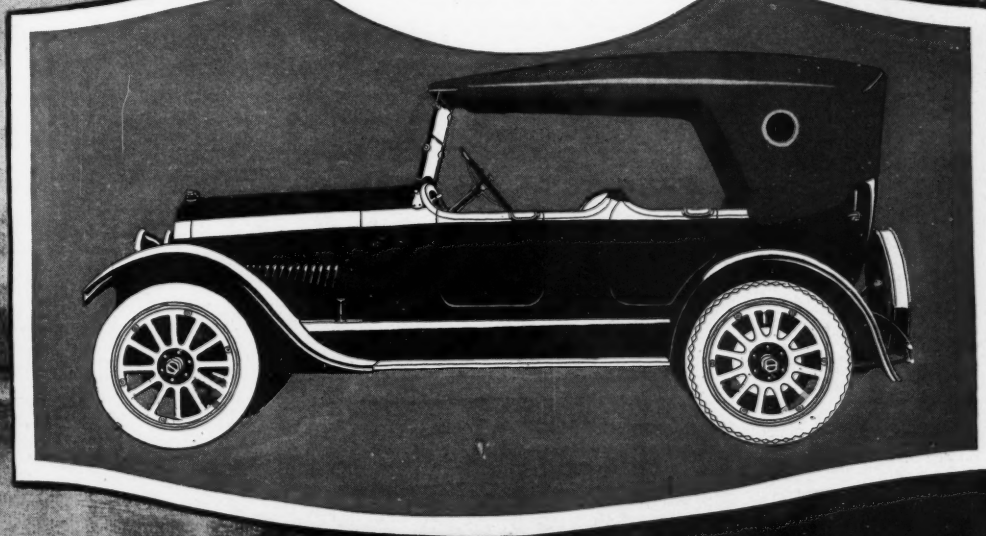
Three-Passenger Roadster.....\$1485
 Four-Passenger Touring.....\$1550
 Five-Passenger Touring.....\$1485
 Five-Passenger Victoria.....\$1660
 Five-Passenger Touring Sedan..\$1985

Prices F. O. B. Factory

Stephens Motor Branch
 of Moline Plow Co., *Moline, Illinois*

Factory: Freeport, Illinois

DEALERS: This is no time for you to associate yourself with an experimental organization. The name Moline Plow Company is an absolute protection for you.



Is Your Territory Open



FEATURES:

MOTOR—Famous Multi-powered motor, valve-in-head; counterbalanced construction; unit power plant; **WHEEL BASE**—115 inches; **CHASSIS**—the improved Crow-Elkhart 10-year chassis; Hotchkiss drive; Stewart Vacuum system; Borg & Beck clutch; **WHEELS**—Tires, 32x3½ inches; **COLORS**—10 color options; 2 upholstery options; **MODELS**—5-Passenger touring car, \$935; 5-Passenger De Luxe touring car, \$995; 4-Passenger Cloverleaf Roadster, \$995; Coupe, convertible, \$1195; Sedan, convertible, \$1395. Wire wheels \$100 extra.

If it is open, Crow-Elkhart, one of the most valuable franchises in the industry, is obtainable. For Crow-Elkhart dealers will net even more substantial profits this year than during the past. They all report good sales of the

CROW-ELKHART \$935 MULTI-POWERED CAR

The **Valve-in-Head** construction as now applied to the Multi-Powered Motor will be a big factor in the heavy sales and increased dealers' profits during 1918.

In this motor the gas explosion is directly over the piston head instead of in a separate chamber—the force is applied direct. No power is lost.

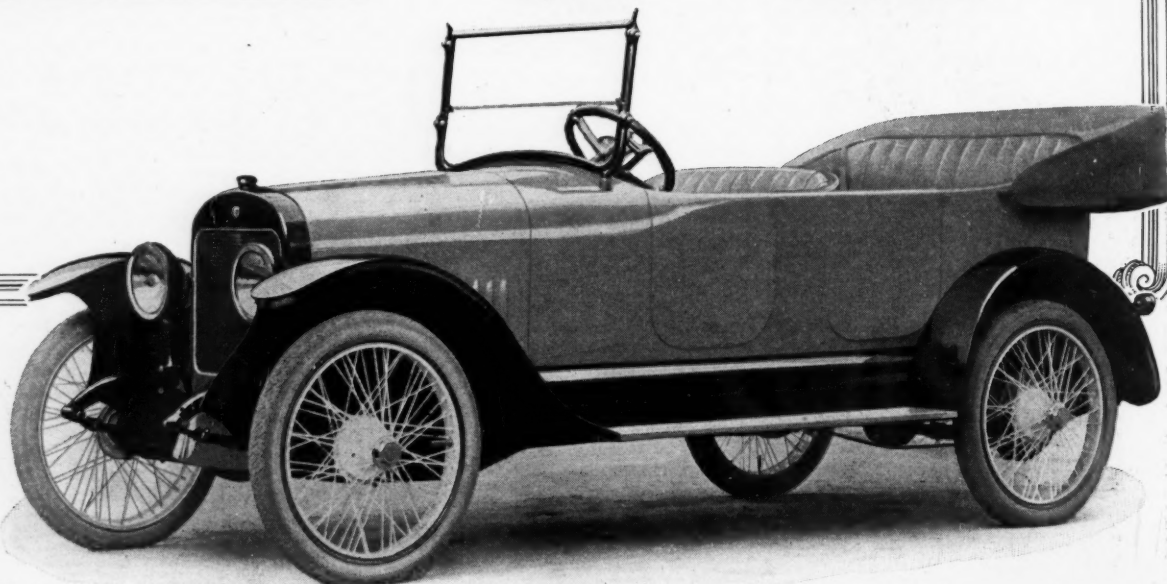
The Multi-Powered Motor with Valve-in-Head construction, extra large valves, bronze back bearings, the Crow-Elkhart counterbalanced construction, three bearing crankshaft and unit power plant, unite to produce that extreme of **smooth power that sells the prospect in one demonstration.**

With more power, custom service—choice of 10 colors and two upholstery options, and the new streamline body, you can offer values found ordinarily **only** in cars selling for more than \$1200.

Wire Today for 1918 Dealer Proposition

Now is the time to line up with the biggest value offered in motor cars. Wire today for your territory.

CROW-ELKHART MOTOR CO.
Dept. 78 Elkhart, Indiana



When Writing to Advertisers, Please Mention Motor Age



HAYES WIRE WHEELS

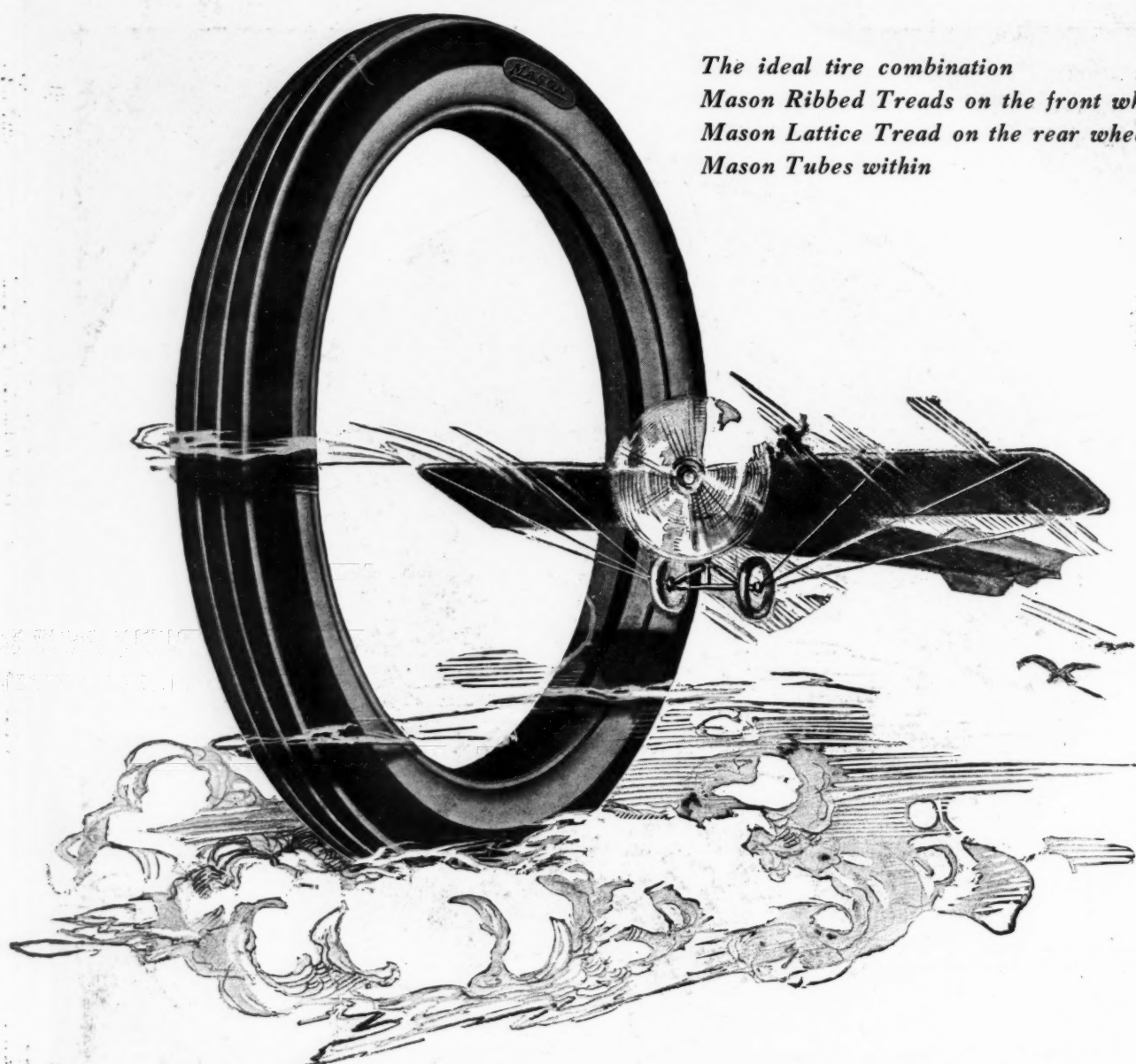
Licensed under Patents Owned and Controlled by the Wire Wheel Corporation of America

A NOTHER feature that commends "Hayes" Wire Wheels to users is the ease with which they may be removed. Even after five thousand miles of travel they can be removed in eleven seconds. There is simply no opportunity for wheel sticking when you want to change a tire. "Hayes" Wire Wheels have the simplest, safest, and most easily understood design for detaching or attaching a wire wheel with speed and satisfaction. Write.

SERVICE AND SALES STATIONS

NEW YORK, Chadwick-Delamater Co., 159 West 24th Street. CHICAGO, C. R. Kyte, Inc., 2023 Michigan Avenue. DETROIT, E. W. McGookin, 1231 Woodward Avenue. BOSTON, Bolcotte Co. TOLEDO, Toledo Tire & Supply Co. CLEVELAND, City Auto Tire & Supply Co., E. 24th St. and Chester Avenue. BALTIMORE, Baltimore Wheel & Hub Co., Gay Street and Fallway. PHILADELPHIA, Brown-White, Inc., 2222 Chestnut Street. MINNEAPOLIS, Perfection Equipment Company.

CASTLE & KYTE, Exclusive Sales Agents
872 Woodward Avenue
DETROIT
MICH.



*The ideal tire combination
Mason Ribbed Treads on the front wheels
Mason Lattice Tread on the rear wheels
Mason Tubes within*

Speeding to the Fore

The "quality tire at a popular price" idea has succeeded. More and more, owners are finding that Mason really means more mileage at lower costs. The reason is simple—just a matter

of flawless design, superior materials and skilled workmanship. Equip your car with Masons—the speedometer will prove that

Progressive dealers find the Mason plan mighty profitable. A line to the factory will bring all the details.

MASON TIRE & RUBBER CO.

Factory: Kent, Ohio

Akron Suburb

MASON

**MEANS
MORE MILEAGE**

DISTRIBUTING BRANCHES:

Cleveland
1806 Euclid Ave.

Chicago
2120 Michigan Ave.

New York
28 W. 63d St.

Kansas City
1732 Grand Ave.

Buffalo
834 Main St.

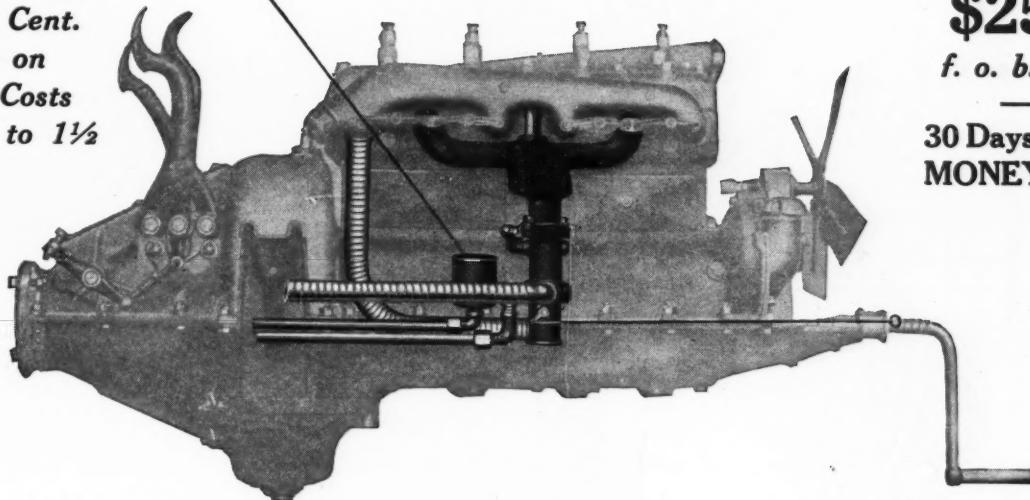
Atlanta
21 Houston St.

Akron, O.
43 W. Market St.

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Detroit Kerosene Equipment For Fords

*One Mile on Kerosene
Costs Less Than
One-Half Cent.
One Mile on
Gasoline Costs
from 1¼ to 1½
Cents.*



Price
\$25.00

f. o. b. Detroit

**30 Days' Trial or
MONEY BACK**

Detroit Kerosene Equipment attached to Ford Engine showing the entire installation except the Gasoline tank located under floor board.

Use Kerosene (Coal Oil)

A Ford car or truck is a daily necessity. It proves a daily economy.

By using Kerosene instead of Gasoline you can effect a further economy of 60 per cent.

**Act Promptly! Buy a
Detroit Kerosene Equipment
For Fords**

Save 60 per cent. of mileage cost

These Are Days of Strict Economy

DETROIT KEROSENE CARBURETOR CO., DEPARTMENT 36
Kresge Building **Detroit, Mich.**

The Kerosene Equipment ready to be attached to Ford engine consists of:

1. The Detroit Kerosene Carburetor (patent pending) with only one float chamber (for kerosene); the three way valve admits the gasoline for starting.
Is non-adjustable—throttles down smoothly—idles without loading—increases mileage—is a positive fuel and money-saver—makes no condensation in cylinders and reduces speed changing.
2. Intake Manifold with drying chamber.
3. Flexible tubings.
4. Gasoline tank, tube and couplings.

INSTALLATION

1. Drill a 7/8-inch hole into center of exhaust manifold.
2. Remove intake manifold.
3. Clamp on new manifold.

The Chilled Rubber Process

THE GILLETTE CORD TIRE IS THE LONG DISTANCE CHAMPION. That it has won this title on the roads is due to unusual laboratory work.

THE "CHILLED RUBBER PROCESS," exclusively used in the manufacture of Gillette Tires, has made the Gillette fabric-tire vastly superior to other fabric tires because of the remarkable wearing qualities this process puts into the rubber used. It has made the Gillette Cord Tire superior to all other tires because it adds this remarkable rubber to the well known strength and wearing qualities of the best cord construction.

EVERY BIT OF RUBBER USED in every Gillette Tire—of either cord or fabric construction—has a toughness, a tensile strength, an elastic, lively, non-tearable, long-wearing quality that is new in tire making. It is a quality produced by the "Chilled Rubber Process," and by no other known means.

During Show Week

A Cordial Invitation is extended to Dealers visiting New York to make our Office their Headquarters while in the city.

Safety

Gillette

The Best Tire Proposition for 1918

A Tire Unique in the Industry—Large National Distributors of Established Reputation—Wide Advertising Generally and Locally—Extraordinary Sales Helps—A Dealer Contract That Gives That Freedom of Action and Certainty for the Future Which Allows the Progressive Wide-awake Dealer to Get Maximum Results.

THE BEST WEARING TIRE

The Gillette will be the most talked of tire of the 1918 season. Its actual record on the roads has already made it the subject of enthusiastic comment. The extraordinary quality of its rubber, due to the "Chilled Rubber Process," has marked a very definite advance in tire manufacture.

Its remarkable wearing qualities have thrown guarantee adjustments into the discard. The fact that every Gillette Tire will deliver *more* than its warranted mileage under any treatment short of actual abuse puts the tire user on a new basis of tire expense. He will count his tire costs by the mile, by the month and by the year. And on this basis the Gillette will win every time over tires that, while cheaper in price, are far more costly in actual practice.

THE BIGGEST PERMANENT BUSINESS

The Gillette Dealer is actually part of the Gillette organization. While preserving absolute independence in the administration of his own territory and an absolute, untrammelled right to the profits of that territory for the future, the Gillette dealer is backed by all the force at our command in the solution of every sales problem that confronts him.

We help him generally by making the best tire possible of manufacture, by wide advertising of a constructive, educational character; and we help him specifically by local advertising, by real sales helps which are plainly printed on his contract so that he may select those best suited to his own particular needs, and by giving him prompt, efficient service, and staunch, generous backing in his relations with his customers.

*If you are a Responsible, Progressive Dealer who wants the very best opportunity for Freedom of Action, Good Profits and a Permanent, Growing Business, write us at once.
Your Territory may Still Be Open.*

THE GILLETTE RUBBER COMPANY

Chicago Office
122 Michigan Ave.

General Sales Office
1834 Broadway, New York

Factories
Eau Claire, Wis.

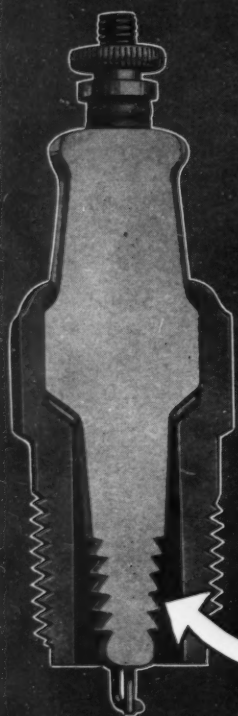
♻ Tires ♻

Announcing The New A.C. Carbon Proof Spark Plug

Here is the first plug made which will not accumulate carbon! It will permanently rid motorists of that trouble which has been their bugbear in the past.

This New AC has been tested for a year on a number of cars and tractors using both gasoline and kerosene in which ordinary plugs would "soot up" rapidly. The perfect results obtained by this new AC have exceeded our highest expectations.

At Last Ford, Overland and Studebaker owners—this is the plug you have wanted to keep your motors hitting on all cylinders all the time.



Price \$1.00

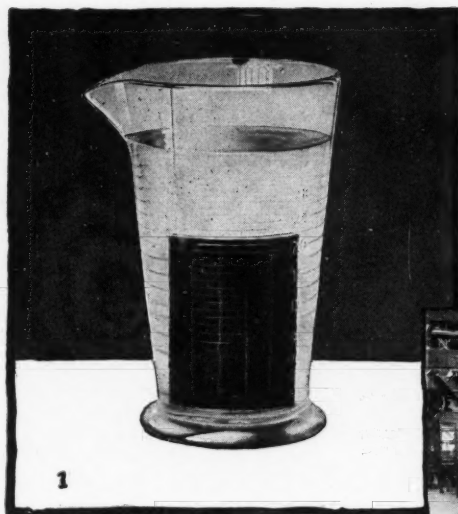
The Reason

A deposit of carbon on the smooth surface of the porcelain is what causes short circuit. In this new AC plug the carbon proof porcelain is provided with a number of ribs having saw tooth edges. These attain a sufficiently high degree of heat to burn away the carbon thereby keeping the edges free from deposits and breaking up any possible short circuit.

Dealers: To secure your share of AC Carbon Proof business, order now and be sure of quick delivery.

AC *The Standard Spark Plug of America*

CHAMPION IGNITION COMPANY
Sole Manufacturers Flint, Michigan

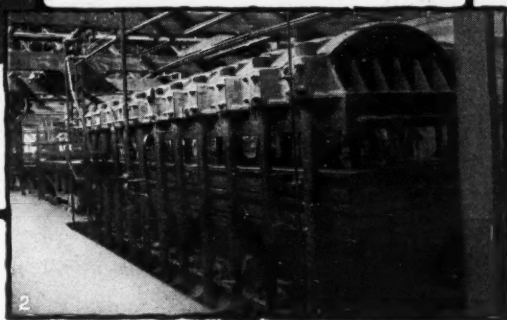


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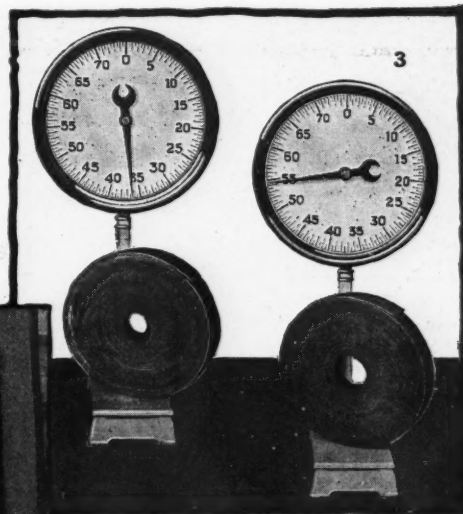
1. Thermoid Brake Lining is Grapnalized. An exclusive feature.

2. Thermoid Brake Lining is hydraulic compressed. An exclusive feature.

3. Thermoid Brake Lining has over 40% more material by actual weight. An exclusive feature.



2



3

Three big facts about Thermoid Brake Lining

known to thousands of motorists everywhere

1. Thermoid is Grapnalized.

Thermoid Brake Lining is impregnated throughout with Grapnal. This exclusive process makes it impervious to gasoline, oil, water, dust, etc. No other brake lining is Grapnalized, or can be. That is why ordinary brake lining will not, and cannot, give the length of life and service that Thermoid Brake Lining does give.

surface ideal for breaking; it can't grab and it can't slip. The "co-efficient of friction" is just right.

3. Thermoid has over 40% more material by actual weight.

This means longer service—best service. *Thermoid is more than 40% heavier than any woven brake lining.* That is why it is better fitted to stand the responsibilities placed upon it.

These three facts most motorists know. Week after week, month after month, national advertising carries the story forcefully and convincingly to America's millions of car and truck owners.

The Thermoid proposition of-

fers you a bigger, better, more profitable brake lining business. Write for details—ask for the new Thermoid dealer book, "50-000,000 lives depend on good brakes."

Our guarantee

Thermoid is positively guaranteed to outwear and give better satisfaction than any other brake lining. *Thermoid will make good—or WE WILL.*

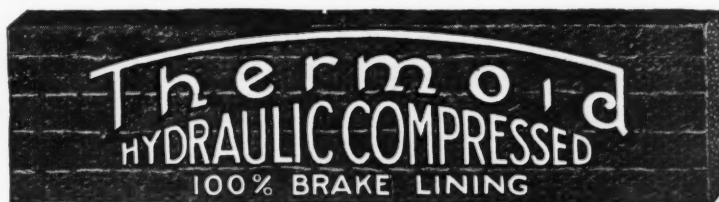
Thermoid Rubber Company

Factory and Main Office: TRENTON, N. J.

New York	Chicago	San Francisco
Indianapolis	Detroit	Los Angeles
Philadelphia	Pittsburgh	Boston
London	Paris	

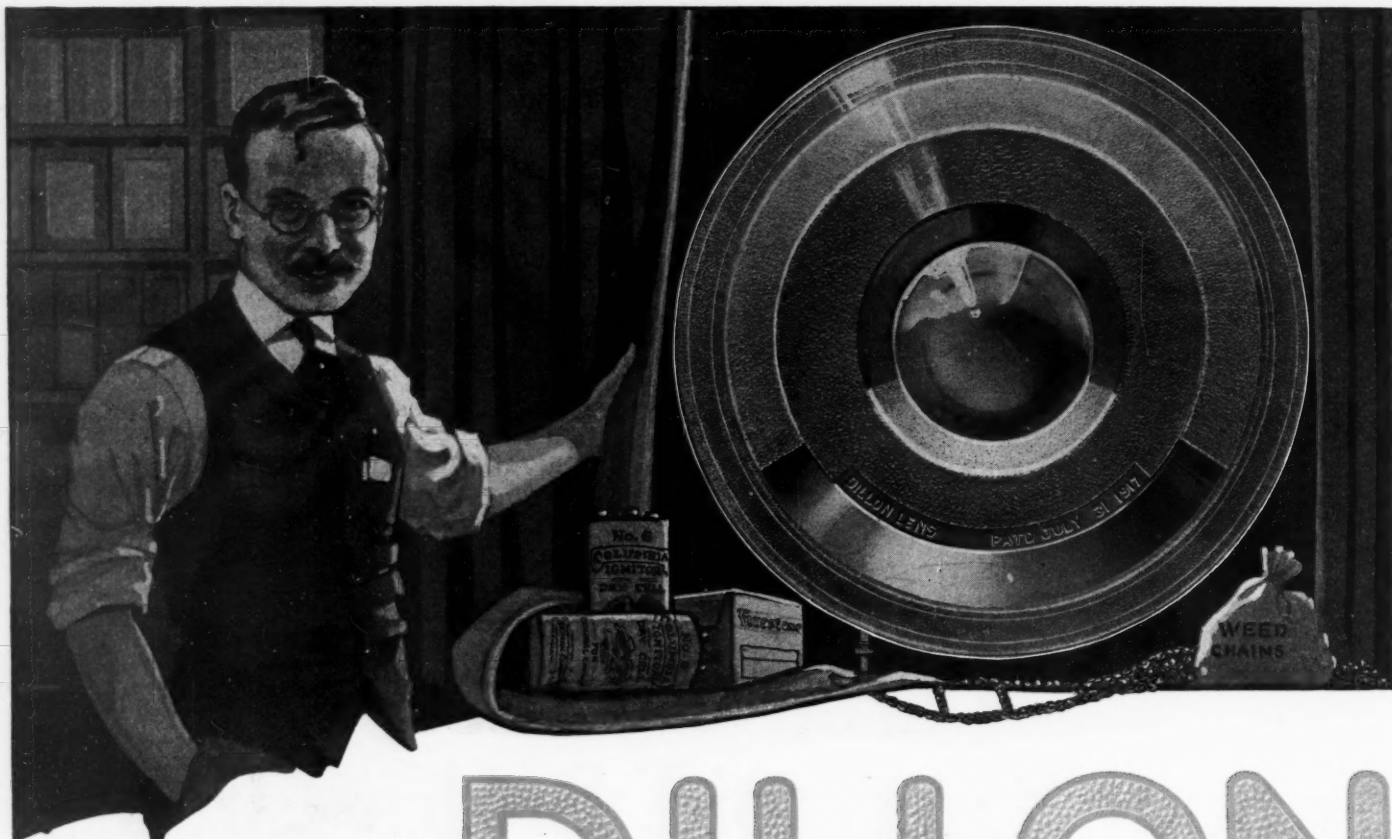
Canadian Distributors: Canadian Fairbanks, Morse Company, Ltd., Montreal. Branches in All Principal Canadian Cities

Winter Business—Cold Weather Made Profitable



Makers of "Thermoid Tires" and "Thermoid Garden Hose"

When Writing to Advertisers, Please Mention Motor Age



This is

Otto Deeler

This original trade character makes every Dillon advertisement *your* advertisement. Through the *Literary Digest*, *Collier's* and other national publications, Otto Deeler will address millions and focus attention on you, Auto Dealer, in a new and effective manner. Cash in on his publicity, get in touch with the Dillon distributors.

COUPON

FOR DEALERS AND JOBBERS

National Distributing Bureau, Inc.,
Oliver Bldg., Pittsburgh, Pa.

I will be glad to have full details of
your proposition and selling helps.

Name

Address

What lens are you handling, if any?
.....

Jobbers' Name MA-1

DILLON

Science finally has triumphed in automobile lens manufacture. At last a lens has been created that answers fully every motoring requirement at night. The Dillon Multi-Vision Lens, perfected after two years of study and research, experiment and tests, now makes its debut in the wake of a crying demand for a lens of dependable performance. *The Dillon does what others claim to do.*

The Lens that Science Built

The Dillon Multi-Vision Lens is *not* a mere piece of pressed glass hurriedly marketed to fill an existing need. It has no colored or frosted glass, no *obstructions* to light. It is designed with mathematical precision.

The Dillon is mechanically efficient. Every angle in its construction has been scientifically determined. Every detail has a reason. The Dillon is the Lens that Science Built—the Lens You Ought to Sell.

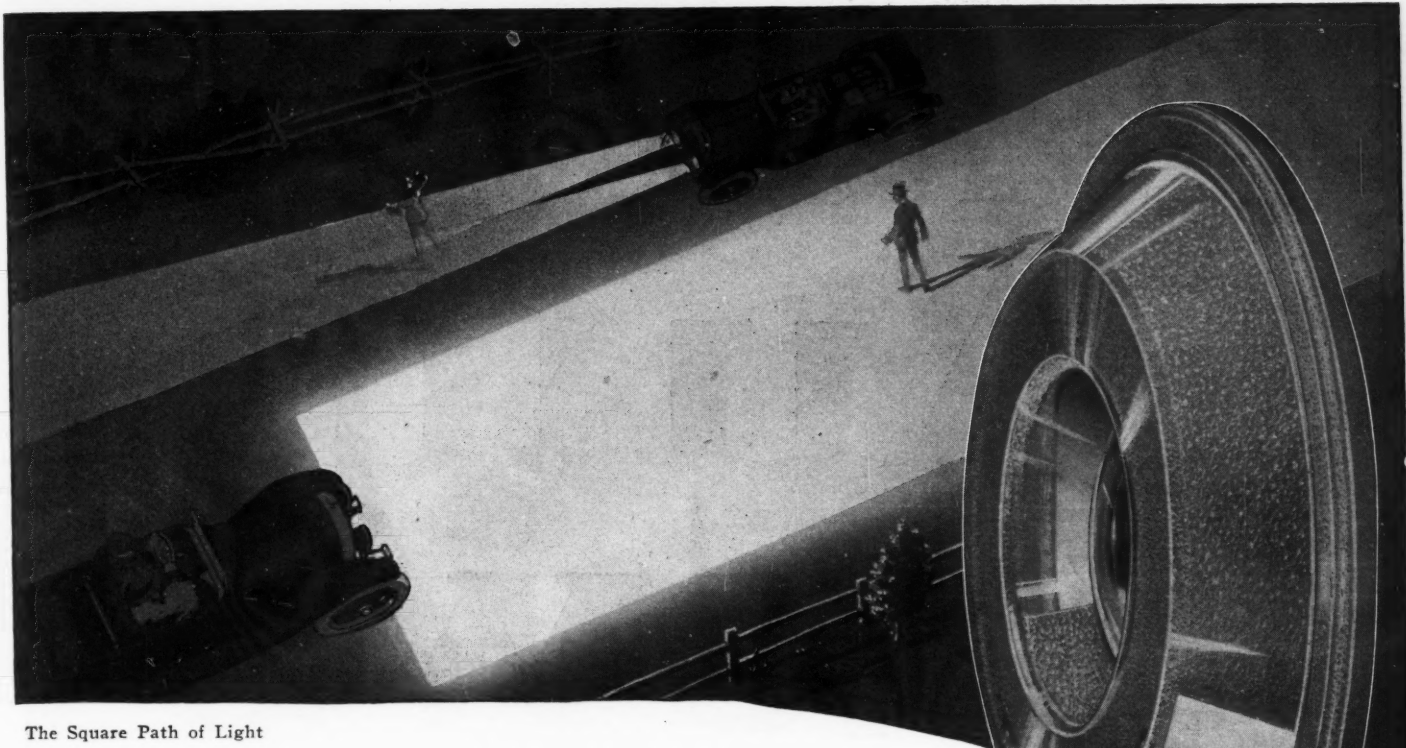
The Square Path of Light

The average lens projects a narrow, fan-shaped beam, dangerous and ineffective. The Dillon Multi-Vision Lens distributes a *square path* of light, giving twice the lighted area, illuminating the road over 500 feet ahead and 25 feet on either side.

This revolutionary feature enables you to drive with absolute safety regardless of speed. All the road is lighted—every obstruction or depression is seen without exaggeration or shadow.

DILLON LENS & MFG. CO., Mfrs. WHEELING, W. A.

TO THE TRADE—Address our Distributors, National Distributing Bureau, Inc., Pittsburgh, Pa., for full particulars.



The Square Path of Light

MULTI VISION LENS

Consider how often you have wanted to sell an automobile lens that finally and positively removes the hidden dangers of the night—a lens that actually justifies its printed claims. Such a lens is the Dillon Multi-Vision Lens. It is the lens every sensible motorist will demand—the lens every progressive dealer will be glad to handle.

Legal Everywhere All Sizes, One Price

The Dillon, despite its intensified area of light, is free from glare. It is legal everywhere, in city or country.

All sizes sell at the same low price, \$3.50. The size is plainly marked on the face of each lens. Thus you will find Dillon Lenses *easy to handle* as well as *profitable*.

Nationally Advertised Profit for You

From coast to coast the Dillon Lens will be advertised. Unlike other campaigns, however, Dillon advertisements will be made *your* advertisements, because of the introduction of an original trade character, representing the auto dealer. (See panel at left of opposite page.)

DEALERS AND JOBBERS—WRITE

If you can visualize and appreciate the demand for a lens so dependably efficient and so widely advertised as the Dillon you will want to meet it. Write us at once and we will send you full details of our generous proposition as well as our unique FREE selling helps.

PERSPECTIVE VIEW

There are three vital features of Dillon design each of which contributes to the *ultimate* in light distribution. The mottled glass diffuses the light, while the clearer portion below illuminates the road at the side and in front, hence a *square path* of light and therefore, *twice* the lighted area. The bull's-eye in the center, a distinguishing feature of the Dillon Multi-Vision Lens, concentrates and magnifies the central beam of light below eye-level. These otherwise dazzling rays are scientifically neutralized, diffused and deflected from the clear glass immediately above the bull's-eye.

\$3.50
per pair
Any Size
Anywhere in U. S. A.

NATIONAL DISTRIBUTING BUREAU INC.

Sole Distributors
for Dillon Lenses



Oliver Building
Pittsburgh, Pa.

The National Auto Shows

Under Auspices of National Automobile Chamber of Commerce, Inc.

January 5-12
at NEW YORK

Jan. 26-Feb. 2
at CHICAGO

**Four Hundred Exhibits of Cars
and Accessories**

S. A. MILES, Manager

7 East 42nd Street, New York City



What Hyatt Quiet Bearings Mean to the Closed-Car

The quietness of Hyatt Quiet Bearings is especially appreciated by everyone who drives a closed-car. Where noises cannot escape, it is essential that every disturbing sound be hushed or eliminated.

In this lies one of the telling features of Hyatt Bearings. Overcoming friction quietly and noiselessly, they perform their duty—unseen and unheard. Never a sound reaches the occupants of the car.

Automobile builders recognize the importance of having their closed-cars possess the quietness of Hyatt Quiet Bearings.

HYATT

QUIET BEARINGS



Bill posting will play an important part in putting Conaphore before the public in 1918.

These leading Magazines will carry the story of the Conaphore all through next year.

The Conaphore
Smooth front surface, Easily cleaned. Does not clog with dust, mud or snow.

These farm journals will give rural car owners the complete story of the Conaphore in 1918.

1918 Advertising Announcement

Conaphore campaign strongest ever put behind an automobile headlight glass

Our 1918 advertising will make Conaphore the best known headlight glass on the market—not only to city, but to rural car owners as well.

We are using two-color, full page advertisements once a month in the Saturday Evening Post. We are using full page ads in Collier's Weekly, Literary Digest, Leslie's Weekly, and Scientific American; also large space advertising in McClure's and the American Magazine.

Big farm paper campaign

We are reaching the rural car owner by an extensive campaign in national and state farm papers. And of course we are advertising heavily in the leading motor publications. The combined circulation of this list totals more than 7,000,000.

The surface of the headlight glass market has hardly been skimmed. Our 1918 advertising campaign is bound to open new and wide fields for profitable business. It will dominate the headlight glass market in every section of the United States

and Canada. It will create sales for Conaphore dealers throughout the entire year.

Consider the merits of the Conaphore. Note the advertising backing we are giving this remarkable

Investigate the Conaphore at the New York Show

Space D-106 will be Conaphore headquarters at the New York Automobile Show, Jan. 5-12, at Grand Central Palace.

Call on us and we will demonstrate exactly why the Conaphore is the most efficient automobile headlight glass.

We will also show you in terms you can't mistake just why the Conaphore is a paying proposition for you to handle in 1918.

Manufactured by the world's largest makers of technical glass

CONAPHORE

Range 500 feet—No glare—Pierces fog and dust

headlight glass. Then decide whether or not you want some of this profitable 1918 business.

Notice to jobbers

If you are among the few who are not handling Conaphores, get in touch with us at once. The Conaphore proposition is sure to interest you. Write us today.

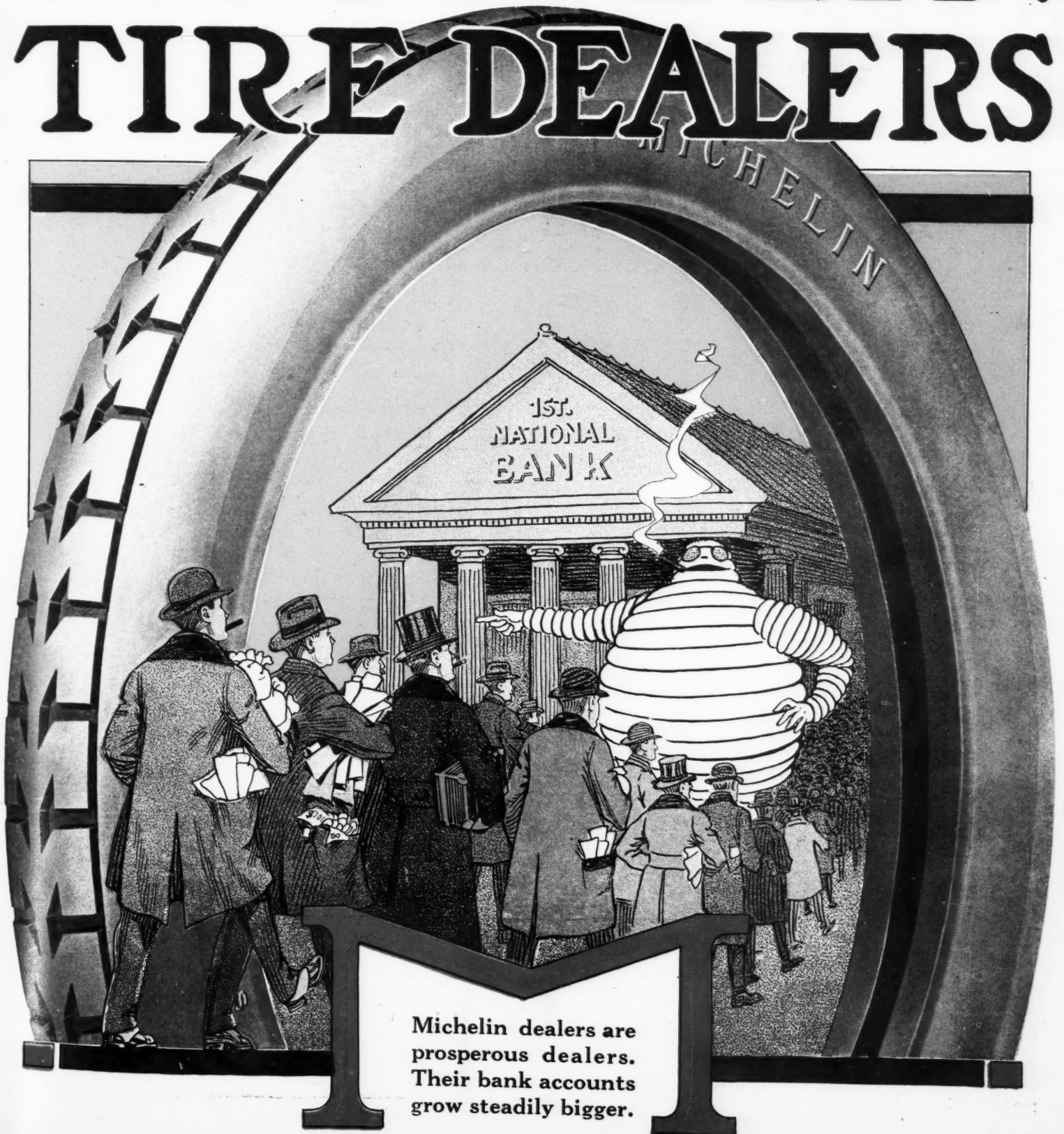
Notice to dealers

Our sales records show a brisk winter demand for Conaphores right now. Secure your share of Conaphore profits. We furnish every cooperation—sales leaflets, display charts, and advertising electros. To insure prompt delivery, get your orders on your jobber's books as quickly as possible.

For special information write to your jobber or direct to us.

CONAPHORE SALES DIVISION
Edward A. Cassidy Co., Inc., Managers
Madison Ave. and 40th St., N. Y. C.
CORNING GLASS WORKS

NOW JOIN *the* ARMY *of satisfied* MICHELIN TIRE DEALERS



Talks to the

Number 5

WE CANNOT SAY it too strongly, Mr. Dealer:

You owe it to yourself to know about Michelin's 1918 proposition.

Your past year may have been a good one. But after you study this new Michelin proposition you'll agree that through it you can make next year still better.

It's one of the best propositions ever offered the tire trade.

Michelin's well-known reputation is your guarantee that this statement does not exaggerate the truth.

So, if you haven't already written, don't put it off any longer, but write today for particulars.

Michelin Tire Company
Milltown, N. J.

TIRE TRADE





THE Michelin Line, Mr. Dealer, gives you an advantage over competitors in every department of the tire business.

The Michelin Red Inner Tube is, as you know, recognized the world over, as the best.

Michelin Casings are just as good as this unequalled tube.

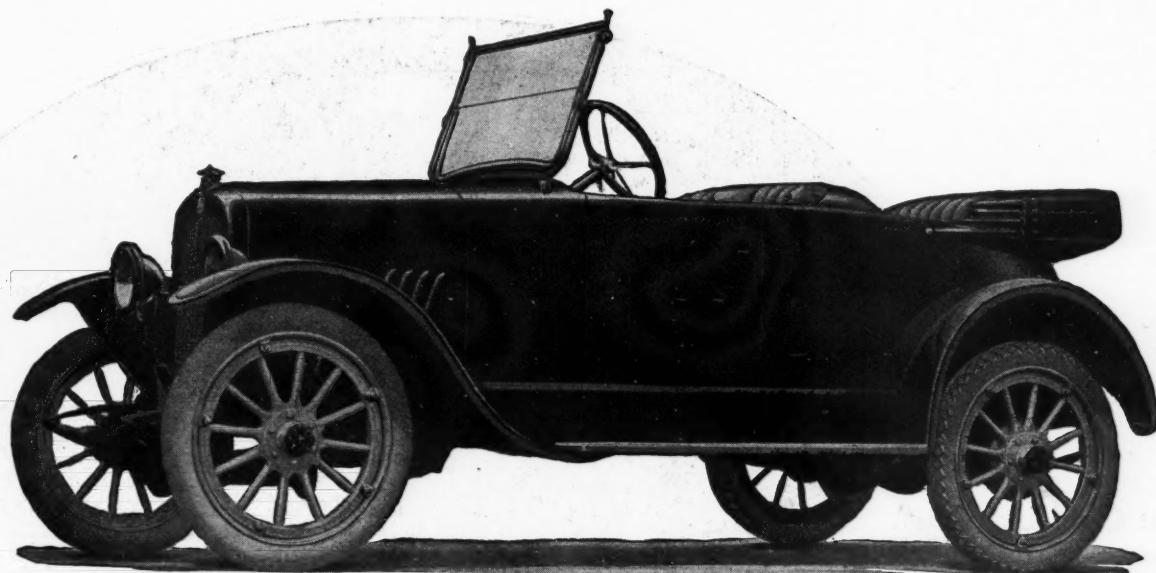
And so are Michelin Accessories—Michelin Mastic (the plastic compound for mending cuts), Michelin Cement, Michelin Patches, etc.

Yet all these goods are moderate in price.

You will build up your tire business and your business as a whole, to a new level by joining hands with Michelin. Write today.

Michelin Tire Company

Milltown, N. J.



WHY I PICKED THE WONDERFUL BRISCOE

By *W. Knauer*
Brown-Willson Co.,
Chicago Distributors

We sized up the light car field—made a thorough study of each car in the class. The evidence overwhelmingly favored the Briscoe.

On this wonderful car with the half-million dollar motor we found those features and extras we would expect only on the higher priced cars.

We tested Briscoe economy—found 25 to 30 miles to the gallon the usual thing—found the Briscoe exceptionally light on tires.

Here, we decided, is the greatest light car value we can offer. We chose the Briscoe—and our ever-growing profits show us we made no mistake.

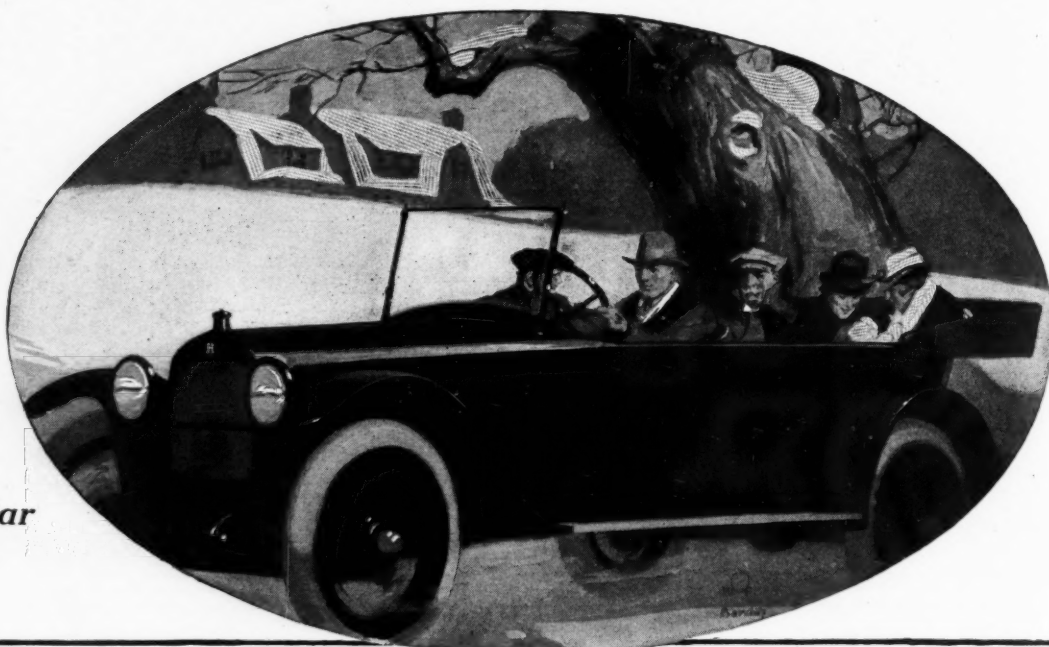
BROWN-WILLSON COMPANY, Chicago.

“THE GREATEST LIGHT CAR”

That's the unanimous verdict. Briscoe dealers everywhere are making money. The Briscoe Franchise is worth thousands of dollars a year. Perhaps your territory is open.
Address

Briscoe Motor Corporation, Dept. 136, Jackson, Mich.

BRISCOE \$725
THE CAR WITH THE
HALF-MILLION DOLLAR MOTOR



The Comfort Car

H

Hupmobile

THE new Hupmobile has probably reached your town by this time.

If you inquire, we think you will find that it has had a wonderfully warm welcome.

We think we can almost tell you what your home folks are saying and thinking.

They are sure to speak especially of the beauty and the *comfort* of the new car.

For nearly eighteen months we have been building and designing to that end.

We wanted to make the word *comfort* mean more in this Hupmobile than it has ever meant in motoring.

We wanted to make the car *suggest* comfort the moment you looked at it.

We wanted to make you *feel* this uncommon comfort the moment you took the wheel.

We wanted to make it worthy of being called the Comfort Car as well as the Beauty Car and the Car of the American Family.

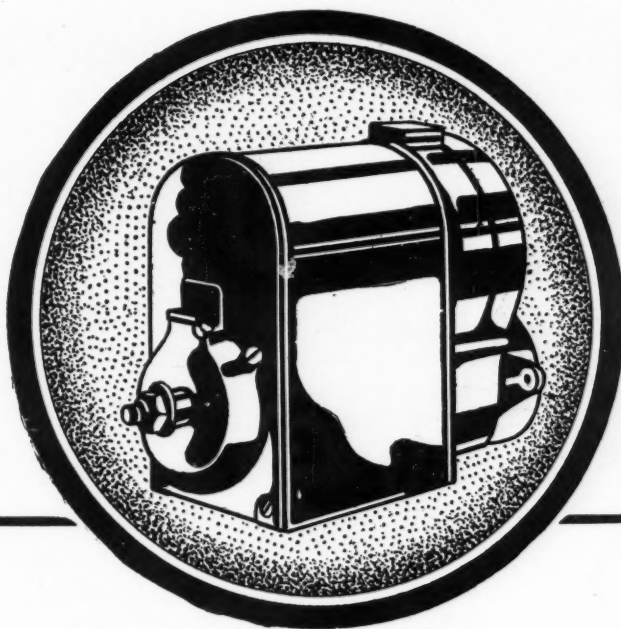
How far we have succeeded we would rather have you say than to say it ourselves.

We have tried to retain all the excellence of all the Hupmobiles that have gone before; and add new and greater excellence.

What we have put into it in time, and thought, and care, and money, and experience, we are sure you will get out of it in comfort of *mind* and *body*, which will make driving the Hupmobile a delight.

HUPP MOTOR CAR CORPORATION, DETROIT, MICHIGAN

When Writing to Advertisers, Please Mention Motor Age



The Difference Between Magnetos

It lies primarily in the design.

Any Magneto maker can use the best selected materials if he will. Some do.

But designs are exclusive. They account for the differences both in sturdiness and in electrical efficiency.

For example, the fewer parts in Eisemann Magnetos, and in particular the one-piece frame, contribute enormously to durability and therefore reliability.

Then, too, the direct route by which the current is picked up and distributed prevents electrical losses.

The patented pole pieces and the excellent proportions of the windings are important factors.

To the combination of all these points of superiority, may be traced the power of the Eisemann spark.

When thorough investigation and comparison is the basis for selecting the Magneto, Eisemann almost invariably earns the decision.

THE EISEMANN MAGNETO CO.

Sales and General Offices: 32-33d Street, Brooklyn, N. Y.

Chicago, Ill., 910 So. Michigan Avenue

Detroit, Mich., 802 Woodward Avenue

THE
EISEMANN
MAGNETO



HELPS INSURE PROMPT DELIVERIES

"The Automobile Trade Directory saves me valuable time. It helps me to get to the source of supply and insures prompt deliveries at the factory."

H. E. Long.

Purchasing Agent,
THE NASH MOTORS CO.

Prompt deliveries by a dealer builds his business. A customer may specify a trademarked brake or clutch lining you do not stock. Turn to *Linings* in the "*Red Book*." You'll find all the manufacturers of woven fabric linings in one group, all the manufacturers of leather and fiber linings in two other groups with their trademarked names—wire your requirements and fill your order promptly.

THE AUTOMOBILE TRADE DIRECTORY
ROBERT WOLFERS, President
243 WEST 39TH STREET, NEW YORK CITY

A Thousand Catalogs In One



'IT HANGS EVERYWHERE'

GETTING ACQUAINTED WITH AMAZON

PROPOSITION PERMANENT CUSTOMERS

No amount of transient trade can ever build a *permanent* business, in any line. Permanence depends upon steady, satisfied customers—the kind that stay with you and send in their friends.

And success depends upon permanence. For success must be real success to be worth while. A temporary splurge is not success. You cannot build a solid, permanent foundation on customers that come and go—no matter in what numbers they come. They must come *and stay*.

The quality of Amazon Supertires is so high—they give the motorist such comfort, and satisfaction, *and mileage*—that he who becomes a customer *stays* a customer.

And that means that Amazon Supertires help Jobbers and Dealers build permanently successful businesses.

Why not investigate further *now*?

(Sixth Ad of a Series)

THE AMAZON RUBBER COMPANY

AKRON, OHIO

New York Branch
218 Amsterdam
Avenue

See us
at the
New York
and
Chicago
Shows

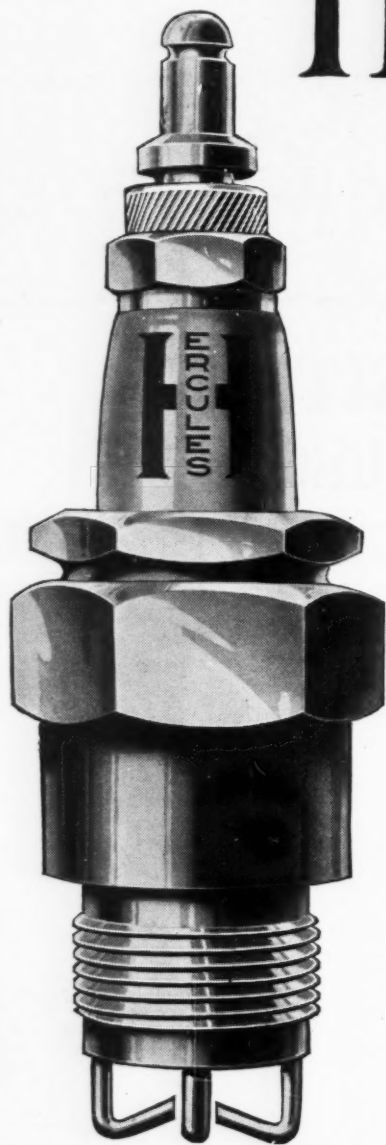
SALES SHEET

Name A-B-Taxicab & Baggage Co.
Address Somewhere N.Y.
Received: Quality Discretionary Value Delivered

1917		1918		1919	
Jan	Feb	Jan	Feb	Jan	Feb
4	5	30	35	Jan 31	0
7	8	30	35	Mar 1	0
1	2	30	35	Apr 1	0
25	26	30	35	May 1	0
18	19	30	35	June 1	0

HERCULES Spark Plugs

HEAVY DUTY TYPE



The HERCULES Giant

spark plug is equipped with stone insulator and designed primarily for use in motors of the heavy duty type, where every extreme is encountered.

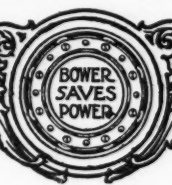
These will be furnished in any and all sizes for tractors and commercial vehicles as well as stationary and marine motors. All the foregoing types are designed especially for this service.

Write Your Jobber

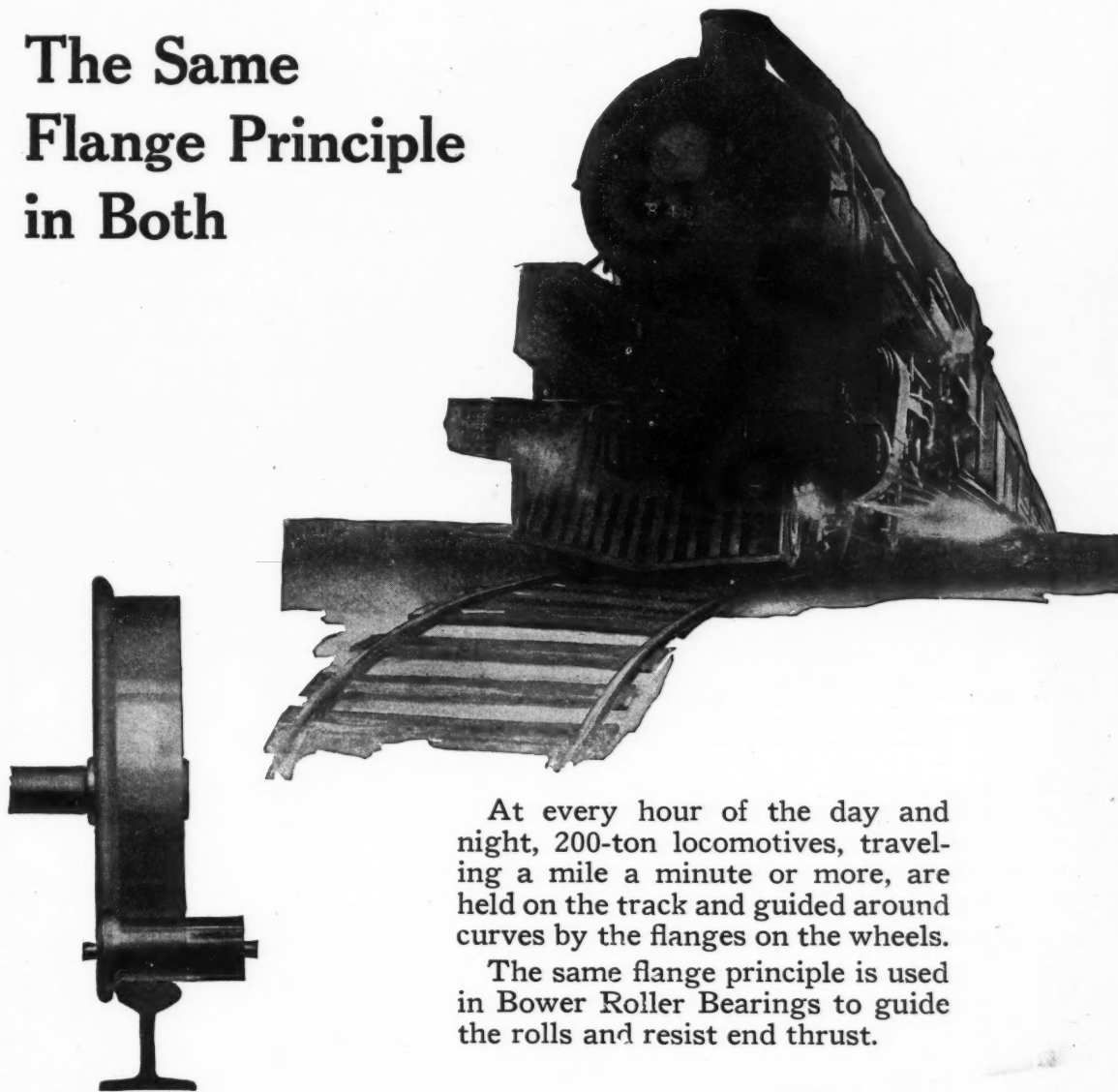
**STRICTLY
QUALITY
PRODUCT**

**MADE IN
U.S.A.**

**ECLIPSE MANUFACTURING CO.
INDIANAPOLIS**



The Same Flange Principle in Both



At every hour of the day and night, 200-ton locomotives, traveling a mile a minute or more, are held on the track and guided around curves by the flanges on the wheels.

The same flange principle is used in Bower Roller Bearings to guide the rolls and resist end thrust.

BOWER

ROLLER BEARING CO.
Detroit Michigan



Stewart LENS

Provides a flood of light, which illumines the full width of the road including side ditches, and *without glare*. This is the big point in the Stewart Lens—complete and adequate illumination *without glare*.

Gives complete illumination, because the light is diffused at its source (the light bulb) before it reaches the reflector.

Not only provides 100% light, but a light that is safer to drive by than ordinary headlights. Because it gives no glare, the Stewart Lens can be used for city driving, with full light turned on, with perfect safety and without danger of police censorship.

The design is based on scientific principles. Consists of a cup-shaped glass bowl which surrounds the light bulb. At the back it fits around the bulb stem. The forward end is open. The outer surface is covered with a series of curved elevations; the inner surface is ribbed.

When the lights are on, the Stewart Lens gives a rich, distinctive appearance to the headlight; adds to the appearance of the car.

The Stewart Lens will fit any car. Can be installed on any headlight. Produces the same perfectly diffused, *no-glare* light on any size headlight. There is only one size; one model. Dealers and Jobbers can fill all orders from one stock item.

The price is \$2.00 per pair, complete. At this popular price the Stewart Lens is within reach of every car owner. Installation takes but a minute—remove front glass, take out lamp bulb, place the bulb stem through the back of the Stewart Lens and replace it in the headlight.

Stewart - Warner Speedometer Corporation
CHICAGO, U. S. A.

\$2
PER PAIR

Why "Dope" Your Radiator to Choke a Leak When You Can Repair It Scientifically?

It is a fact that the car owner feels most *helpless* when his radiator leaks.

He *can* drug his radiator with cements, meals or powders—but no *careful* motorist does this. He knows that soldering is expensive—and that the high heat of the soldering iron frequently ruins the radiator. Up to now he has preferred to take this chance—and pay big repair bills—rather than clog the entire cooling system with "dopes."

Thinking motorists have *always* wanted a product that would repair leaks *scientifically*, *economically*, and *permanently*. And they have *instantly* grasped the *significance* of this new chemical discovery—"X" Radiator Liquid. Last year they purchased over 500,000 cans of it!

Repairs Leaks Without Metal or Fire!

"X" Radiator Liquid is a *scientifically correct* process of repairing leaks in the radiator, pump, waterjacket, motor head gasket, etc.

You simply pour "X" into the radiator. It instantly combines with the water and circulates freely through the cooling system.

Whenever "X," in solution with the water, finds a leak, it flows through. The oxygen in the air immediately changes the "X" into a solid, making a *permanent repair* capable of resisting over *quarter of a ton pressure*.

"X" Radiator Liquid requires no bother, no tinkering—no fuss—nothing to take apart. "X" repairs any leak in *ten minutes*!

A Rust-free, Scale-free Cooling System

When "X" has sealed a leak the surplus remains in the water. This neutralizes the corrosive elements and prevents rust. It also prevents scale—keeps the water passage free and clear and *improves cooling*.

"X" Liquid is the *only* product for repairing leaks in the cooling system that has the recommendation of radiator makers and automobile engineers. It is used by the General Electric Company, American Telegraph and Telephone Company, Standard Oil Company, etc., etc.

"X" LABORATORIES, 630 Washington Street, BOSTON, MASS.

Don't confuse "X" with so-called compounds, cements, powders, etc. "X" is a *pure liquid*. It will not gum or clog the cooling system.

Be careful what you put into your radiator. Imitations are dangerous! Ask your dealer for the genuine "X" Radiator Liquid. If he hasn't yet stocked we'll ship direct if you give us his name. **LARGE SIZE, \$1.50, will do a \$25 repair job!** **FORD SIZE, 75c, will do a \$15 repair job!**

Dealers! "X" Liquid Helps Your Winter Business

"X" Liquid works in any anti-freeze solution and can be sold *all winter*. Keep "X" in stock—display it prominently. Every motorist needs "X." It is a preventive as well as a cure.

Get Our Extra Profit Assortment

Here's a profit-maker. Nineteen cans of "X"—twelve 75c cans and six \$1.50 cans. We give you one \$1.50 can FREE. Costs you \$12. Sells for \$19.50. We include a handsome mahogany display stand, selling literature, posters, etc. "X" is to be *nationally advertised*.

Ask your jobber for our assortment. Or we will ship direct through your jobber. Use a postal card or the coupon below.

RADIATOR LIQUID

REPAIRS LEAKING
FORD RADIATORS
AND CRANK
WATER JACKETS
IN 10 MINUTES - MAKES
THE COOLING SYSTEM
LEAK-PROOF - QUIET -
SCALE-FREE

PRICE \$1.50

REPAIRS LEAKING
AUTO RADIATORS
WATER JACKETS
ON 10 MINUTES - MAKES
THE COOLING SYSTEM
LEAK-PROOF - QUIET -
SCALE-FREE

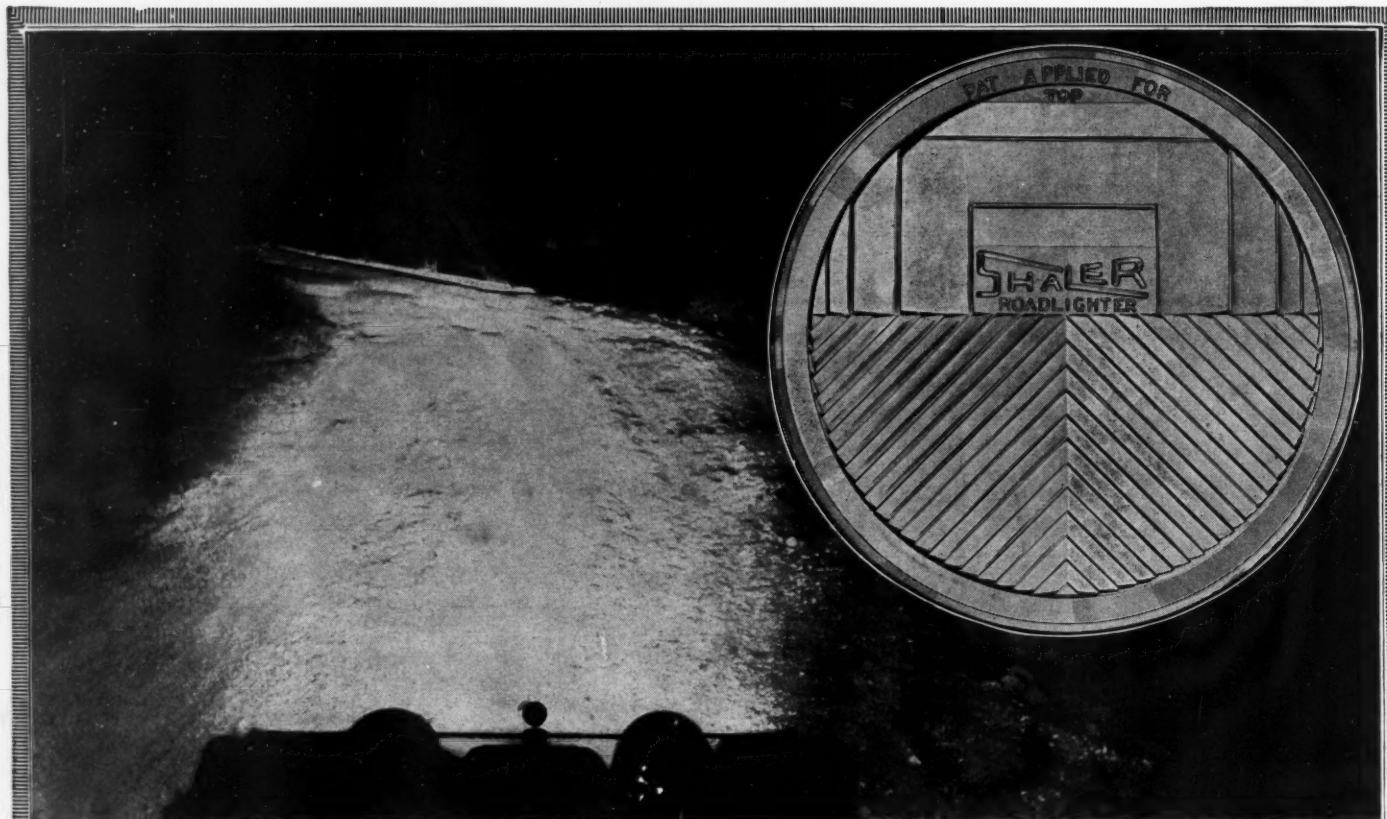
MADE IN U.S.A.
"X" LABORATORIES
630 WASHINGTON ST. BOSTON, MASS.

When Writing to Advertisers, Please Mention Motor Age

"X"
Laboratories,
Boston, Mass.

Gentlemen:
Please ship me "X"
Dealer's Assortment with
\$1.50 can—FREE.

My jobber's name is



Unretouched Midnight Photograph by Fowler, Evanston, Ill.

The Perfect Light for Night Driving

It solves the glare problem, because it has no glare—absolutely none—but what is more important, it makes night driving safe and enjoyable—it obviates the need of dimmers, spotlights, auxiliary headlights and high candle power bulbs which drain the batteries and impair ignition.

You can now drive at night—just as safely—just as fast as in daytime—without constant fear of danger, without stopping and dimming your headlights to allow another car to pass. The SHALER Roadlighter lights the entire road—from fence to fence—with a bright, white, evenly distributed light.

The SHALER Roadlighter has been subjected to the most rigid tests by illuminating experts.

State, city and police officials have given this remarkable lens their approval—accident insurance companies endorse and recommend it.

We have tested it so thoroughly—that we absolutely guarantee every pair of SHALER Roadlighters.

SHALER ROADLIGHTER

*Pierces the Glare of Approaching Headlights
Illuminates the Ditches
Accurate Focusing Unnecessary
Easy to Keep Clean*

*Shoots the Light Far Ahead
Legal Everywhere
Rays Penetrate Fog and Dust
Easy to Install*

Limited Offer to Dealers Only

We want every automobile accessory dealer in the United States to try out a pair of SHALER Roadlighters on his own car—AT OUR EXPENSE.

Mail the coupon for full particulars regarding this big offer. There is no obligation—don't put it off—clip and mail coupon now.

C. A. Shaler Company
9203 Fourth St. Waupun, Wis.

Dealers' Offer Coupon

C. A. SHALER CO., 9203 Fourth St., Waupun, Wis.

Gentlemen: Send me full particulars about your offer to let dealers try out a pair of SHALER Roadlighters at your expense. This obligates me in no way.

Name

Address

City and State

My Jobber's Name Is

When Writing to Advertisers, Please Mention Motor Age

The Most Remarkable Automobile Top Material —Yet Produced



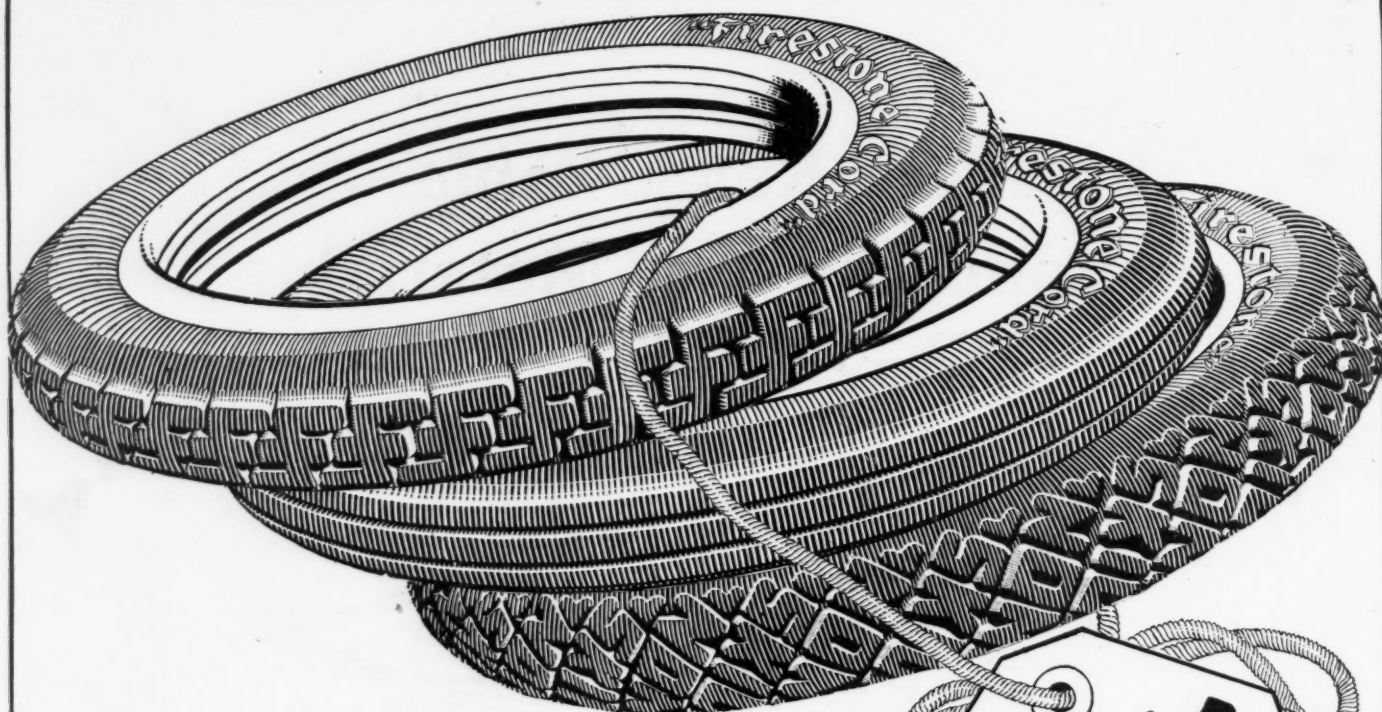
DrideK with its leather finish, will not scratch or chafe—you can put up your top and feel sure that there are no marks on it; nothing to show where a big wrinkle has been strapped down.

DrideK with its leather finish, stands the hard wear that makes satisfied customers; and greatly increases the value of any automobile.

DrideK is one of the specialties in the big line of rubberized fabrics that has helped in popularizing our big line.

Send for samples and prices. They will meet with your approval, and fit well into your specifications.

L. J. MUTTY COMPANY
BOSTON, MASS.



Unanimous Approval by Engineer—Purchasing Agent—Dealer

FIRESTONE TIRES stand well with men who are responsible for pleasing the public. Their measure of values is the stern question, "Will it make good with the car owner?" They recognize the influence of the name Firestone.

They know the character of Firestone materials and workmanship. They have felt the sweep of public opinion in favor of Firestone. That is the final proof of Firestone performance.

Firestone Tires, both cord and fabric, well deserve the honors they have won. As factory equipment on cars of the first rating, they have shown not only good selling value at the start, but "staying" qualities at the finish. They are an added inducement on any car, whatever the price class.

Firestone Tires merit the investigation of every man connected with tire purchase for car manufacturers.

FIRESTONE TIRE AND RUBBER COMPANY
Akron, Ohio Branches and Dealers Everywhere

OK

L. G. Bennett
CHIEF ENGINEER

O. G. Atkinson
PURCHASING AGENT

John J. Bowen
DEALER

**Six-45**

7 Passenger Touring and Club Roadster

\$1685

F. O. B. St. Louis

Six-66

7 Passenger Touring and Club Roadster

\$1850

F. O. B. St. Louis

Style and Stamina

—thoroughly in keeping, however exclusive the surroundings may be—designed, fitted and finished to emphasize the Moon's established reputation for the distinguishable beauty of smart-lined advancements and the most modish and comfortable of interiors. Powerful; smooth-running

—equally at home in an emergency or over the trying road of long usage. See the popular priced Moon Touring Cars. Or, if your preference as to type is the club roadster, coupe, cabriolet, sedan or victoria, you will find its up-to-the-minute example of distinctiveness in the Moon line.

The New Moon Six-36

—the season's most pronouncedly successful motor car debutante. Built and priced to afford six-cylinder riding and driving superiority at the quantity-lot Four first cost and with the after economy of a sturdy, tire and gasoline saving light car.

The Six-36's specifications include: F. O. B. St. Louis
114-inch wheelbase—sweeping high double cowl and long, high Fedder radiator—genuine honeycomb slanting windshield—walnut instrument board, front and rear—solid—beautifully finished—Timken bearings—Spicer

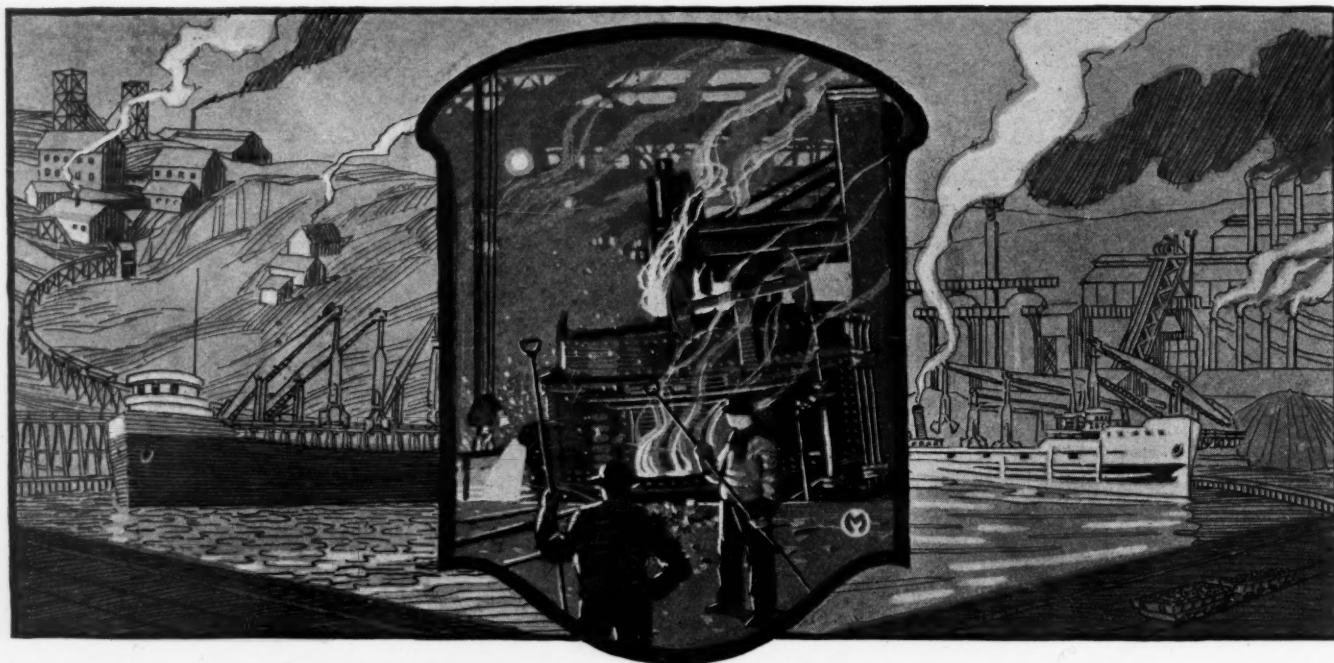
\$1195

joints. Car owners and dealers alike have been wondering how we can turn out the Six-36 to sell for \$1195. The answer is to be found in the demand for the car, together with a corresponding huge increase in the capacity of our plant. The big new Moon plant and its modern equipment bring our output up to the 10,000-car mark.

Territories are being grabbed right and left; and the dealer who wants a location should write at once—or wire.

Prices subject to
change without notice

MOON MOTOR CAR COMPANY
St. Louis, U. S. A.



Now being used in the
Manufacture of

*Typewriters
Building Supplies
Automobiles
Motor Trucks
Motor Accessories
Electrical Equipment
Farm Implements
Ranges and Stoves
Steel Furniture
Sporting Goods
Phonographs
Dental Supplies
Railway Supplies
Telephone Equipment
Ornamental Iron Work
Arms and Ammunition
Etc., etc.*

Steel—so hard to get so easy to save!—

Think of the millions of dollars invested in the steel industry—bringing the ore from the mine—refining it in the mammoth smelters. And the hundreds of thousands of men employed!

Then think that 23% of all of this valuable metal is allowed to rust away each year! It is almost unbelievable. The waste is so stupendous that the human mind can hardly fathom it.

When it might be prevented if iron and steel products were only protected properly against this rust. There is now a satisfactory method of rust-proofing iron and steel—the Parker Process.

This method is being employed today by over five hundred of the leading manufacturers of the coun-

try. The value of it—the absolute reliability of the results—cannot be questioned when so many of the great industrial authorities endorse it.

The Parker Process can be fitted into your production plans. It does not interfere with efficiency—is not prohibitive in cost. It is extremely practicable—because it is not electrical, a paint, or a coating of any sort.

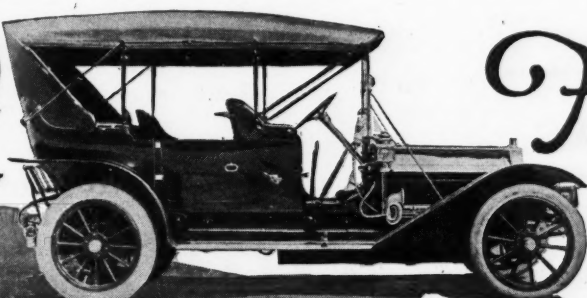
We would like to tell you more about the Parker Process. Also we will gladly perform any experiments you may desire to show that it is practicable for your particular product. Furthermore, our plant is open for any inspection to anyone interested in the protection of rust. You will be welcomed at any time.

PARKER RUST-PROOF COMPANY OF AMERICA
DETROIT, MICHIGAN

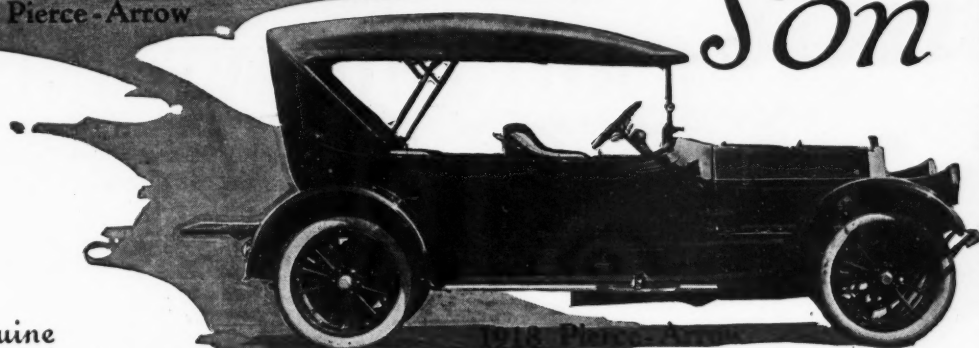
No. 17



1902 Pierce-Arrow



1910 Pierce-Arrow



1918 Pierce-Arrow

Genuine Pantasote Top Material

was used on the first Pierce-Arrow cars. It has been standard equipment on Pierce-Arrow cars ever since.

Facts like this explain Pantasote prestige

Throughout all these years Pantasote has rendered Pierce-Arrow owners dependable service and has fulfilled the rigid requirements demanded by the makers of this master car.

Pantasote was on the first Pierce-Arrow because it was the best Top Material. It is on the last Pierce-Arrow for the same reason.

What better proof of top material quality could be asked for?

Pantasote costs more than other top materials. The makers of cars listed here can truthfully say that they provide the most expensive of all top materials. They give the car owner the most costly and the best.



Avoid misrepresentation, even though it be unintentional. Look for this label on tops represented as Pantasote.



Pierce-Arrow	Chandler
Locomobile	Premier
Marmon	Cadillac
White	Reo-Six
Mercer	Columbia
Hudson	Cole
Chalmers	Westcott

THE PANTASOTE COMPANY
1708 Bowling Green Building New York, N. Y.

More Than 75,000
People Intensely
Interested in
Motor Cars

are going to read the
Big Show Issues
of
AUTOMOTIVE INDUSTRIES

New York Show Issue Jan. 3

Chicago Show Issue . . Jan. 24

and

MOTOR AGE

New York Show Issue Jan. 3

Chicago Show Issue . . Jan. 24

Will YOUR Advertisement Be There
for Them to See?

No more important advertising opportunity is presented during the whole year to the manufacturer of motor cars, parts or accessories. The leaders in your line will be represented by strong advertisements in these issues. Your presence among them will be expected. Your absence will be conspicuous.

These issues will be preserved by their readers. The information they contain is of **permanent** value and obtainable **nowhere** else in just this shape.

Get Your Order in AT ONCE
for Sufficient Space to
Represent Your Product
Properly

THIS IS THE LAST CALL!

The Class Journal Company
239 W. 39th Street
New York

Mallers Building
Chicago

REPUBLIC SPECIAL

Full 3½-ton with the usual Republic capacity for excess strain. Chassis \$895, or complete with bow top and stake or express body, \$995.

Six other models. All capacities up to and including 5-ton.



Over 1000 Dealers Succeed with the Republic

REPUBLIC Dealers in every state share the unparalleled success of the Republic factory. Our prosperity is *their* prosperity. Today, to be known as a Republic dealer is to make secure your leadership in the truck market.

The Republic dealer has the backing of the big Republic plant—the long roll of victories of Republic Trucks on every job—and Republic National Advertising.

The Republic advertising campaign is the largest ever made on motor trucks—which is another reason for Republic volume and low prices. The dealer who joins the Republic forces now comes in on the high tide of a business that takes every truck our factories can produce. Write for our liberal proposition.

Republic Motor Truck Company, Inc., Alma, Mich.
Dealers and Service Stations in over 1000 distributing centers

Seven Models ¾-ton to 5-ton at low prices

Republic Special chassis, \$895; Republic Dispatch for delivery purposes, \$895; 1-ton with bow top and stake or express body, \$1195; 1½-ton chassis, \$1450; 2-ton chassis, \$1885; 3½-ton chassis, \$2750; 5-ton Thoroughbred chassis, \$4250. All prices f.o.b. factory. We furnish every type of body. Write for book on any model. Address Department J

REPUBLIC



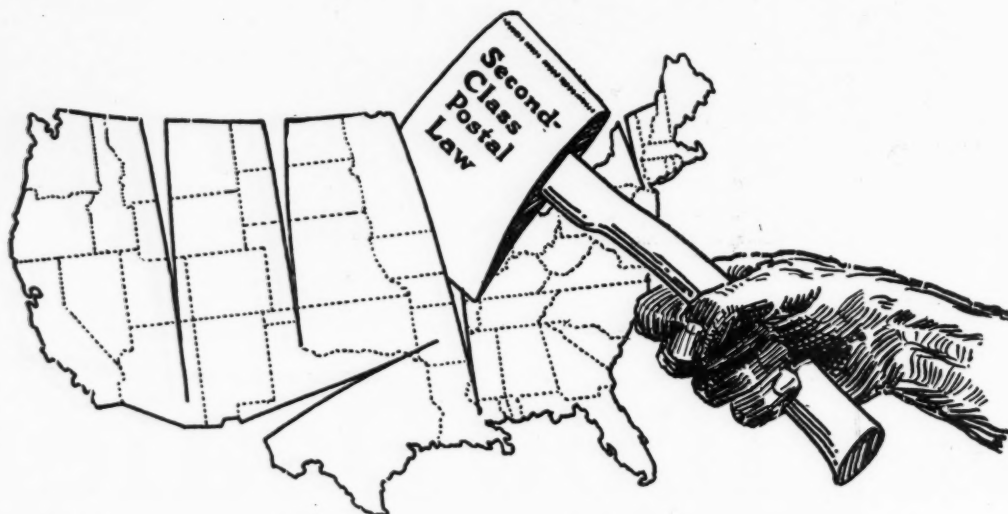
TRUCKS

When Writing to Advertisers, Please Mention Motor Age

America Must Be United

In this time of unprecedented national peril and world peril, America must be strong with the strength of unity—one nation. America must be bound together, as it is today, not so much by the machinery of Government, as by Ideas, held in common by all and fully exchanged, so that all the people throughout the country may understand and sympathize with one another. This is what has brought this great nation together

and holds it together. This result has been accomplished primarily by the Press—particularly the weekly and monthly periodicals and business papers. These periodicals have not local or sectional bias; they go to all parts of America, and serve all parts alike; their great service is in helping to bring all sections close together into one great nation, through a common understanding.



America must not be split into a half dozen sections

Weak with the ILLS and EVILS of Sectionalism

But such a disastrous result is not only possible, but probable, unless the present law pertaining to second-class postage is repealed before it goes into effect. Postal legislation was enacted in the present Revenue Bill, which divides the country up into "zones" and progressively increases the average carrying charge upon newspapers and periodicals from 50 to 900 per cent.

These nation-binding publications are confronted with certain injury or destruction—

which means loss to you personally, and loss to your country. It will destroy a large part of the periodicals. You will be deprived of the papers that have kept you informed on your country's problems, that have helped you in your work. Your children will lose the clean publications that have entertained and helped educate them. And eventually, such magazines as do survive, will cost you much more.

NO INCREASE IS NECESSARY

Last Year the Postal Department Earned a Surplus of Nearly \$10,000,000

The Post Office was never intended as a tax-gathering institution. It was basically designed to give service to the people—to all the people at the same rate. The Publishers are not trying to evade taxation. They will gladly accept any rate of tax upon their profits that may be levied. Most of them have gone on record as being willing to turn over to the Government their entire net profits for the period of the war. They already pay

proportionately more taxes than most businesses, but this advertisement is not designed to parade selfish troubles, but to awaken your interest in the danger of permitting the destruction or obstruction of the channels of national intelligence.

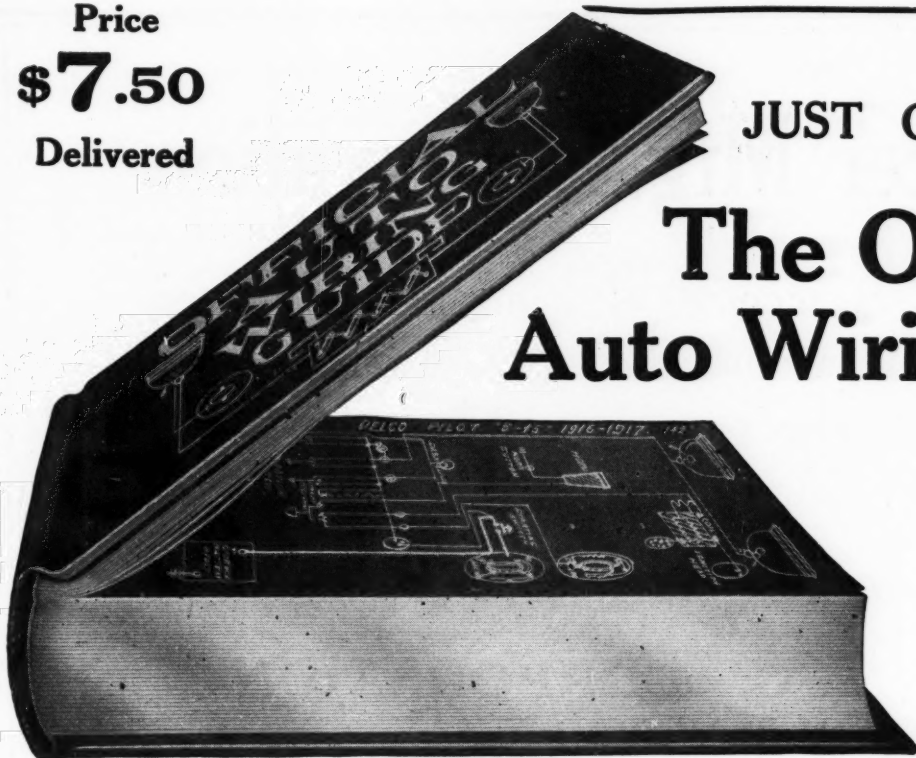
This is the time of all times when America must be a united America—one nation strong with the strength of unity.

Let Your Influence Be Used To That End

THE ASSOCIATED BUSINESS PAPERS, Inc.

The International Organization of Trade, Technical and Class Publications
HEADQUARTERS, 220 WEST 42nd STREET, NEW YORK

Price
\$7.50
 Delivered



JUST OFF THE PRESS

The Official Auto Wiring Guide

*The Most
Valuable Aid
Ever Offered the
Automobile
World*

A Book of Guaranteed Correct Blueprint Diagrams

showing complete wiring circuits of all cars, many dating back to 1912 and including 1917 models; also internal, external standard and other detail diagrams of all starting and lighting systems used on all makes of cars today. Blueprint diagrams for re-wiring cars covering every possible combination of lights and horn and showing the exact size of wire to use; also diagrams of Cutler-Hammer switches for the various controls giving stock numbers for re-ordering when necessary to renew parts, which is a great time-saver.

500 pages—463 blueprint diagrams. Indexed so you can instantly find any diagram of any car or system desired.

Why This Guide Differs from Any Other Publication

Other books have been advertised as containing "hundreds of diagrams, each simple drawing a complete diagram." These have invariably been reproductions of standard diagrams put out by manufacturers of various systems, and are NOT CORRECT because the engineers of the car manufacturers always install the system to meet their own requirements and to better accommodate their particular make of car. Each car diagram in the Official Auto Wiring Guide is for a complete car and shows the circuits EXACTLY as INSTALLED and not as they are supposed to be or could be installed. This feature alone makes our diagrams invaluable and incomparable with any diagrams ever before offered.

Our diagrams are the only ones obtainable in blueprint form. Every mechanic appreciates that a blueprint is easy to read and will not show greasy finger marks. Each one of the 463 guaranteed diagrams are so indexed that you can instantly turn to any particular diagram covering any make or model of car or any system that you desire without any waste of time. Diagrams covering all the various "orphan" cars are also shown.

Battery Information

The electric battery is the heart of an automobile. You will find in the Official Auto Wiring Guide information of real practical value that will teach you more in a few hours' time regarding the care, repair and operation of storage batteries than you have probably ever realized possible. This battery information is based on the latest practice and was prepared with the utmost care by some of the best battery experts in the country today, and is alone worth many times the cost of the Guide.

Whether you have had six months' or six years' experience with starting and lighting systems, the Official Auto Wiring Guide will pay for itself on each job where the trouble is electrical. With it you can do more jobs in a day—do each one quicker; you can better satisfy your customers, build up your reputation as an electrical expert and make more money each month.

Special Price—\$7.50—Delivered

Make the right start now by ordering your copy from

U. P. C. BOOK COMPANY, Inc.

241-249 West Thirty-Ninth Street

New York, N. Y.

The Spicer Mfg. Corporation

announces that on account of being well protected with the necessary raw materials, it is prepared at the present time to fill orders promptly for Universal Joints for TRUCKS and PLEASURE CARS.

We Invite Your Inquiries

SPICER MFG. CORPORATION
SOUTH PLAINFIELD, N. J.

L. D. BOLTON
2215 Dime Savings Bank Bldg., Detroit

A. H. COATES
41 Spear St., San Francisco, Cal.

TO MEET A GROWING DEMAND PROTEXALL'S



Today's demand for efficiency, and increased production, has been in one way answered by the

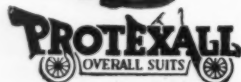
Protexall Overall Suit

A one-piece garment made of Uncle Sam's khaki, which he has found is the best for wear and service; designed by experts who have evolved a special spring back that eliminates all strain.

Farmers, automobilists, repair men, mechanics, all tradesmen need and are buying one-piece suits.

Protexalls will more than meet the demand for one-piece suits.

They Are Sold Only by Jobbers



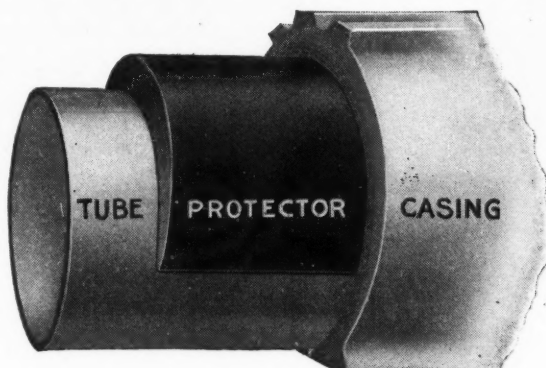
THE PROTEXALL COMPANY, Abingdon, Ill.

Eliminates Tire Troubles

THE Coffield Tire Protector has given freedom from tire troubles to thousands of pleasure and delivery car owners all over the country.

Made of firm and elastic rubber, without a thread of fabric, it is fully covered by patents and is the only device of its kind on the market.

The Coffield Tire Protector prevents punctures by turning nails, tacks, etc., down before they reach the inner tube; and it prevents stone bruises, thus greatly increasing the life of the casing in which it is installed.



Many of our users get unbelievable mileage by the use of this device.

The Coffield Tire Protector is a boon to the woman motorist. Her mind is free from tire trouble worries, for she knows she will get to her destination, without having to stop and wait for help.

The Coffield Tire Protector, with proper use, will outlast many sets of tires. It pays for itself in a short time by the extra mileage it gives.

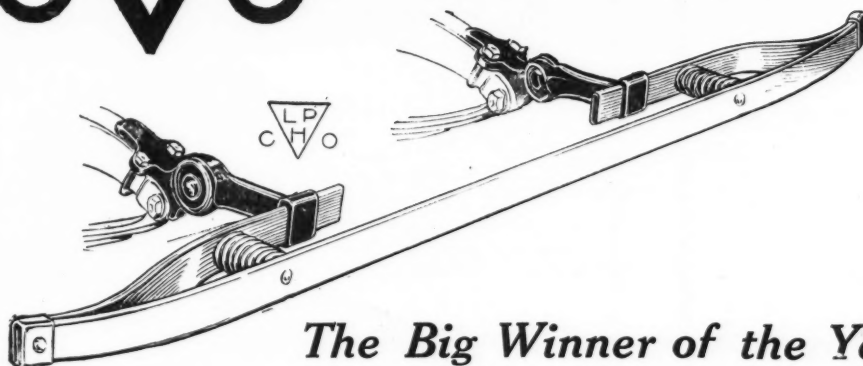
See us at the New York Automobile Show, January 5-12, Booth No. 43, fourth floor.

WE STILL HAVE A FEW CHOICE STATE AGENCIES OPEN FOR HIGH-GRADE DISTRIBUTORS

The Coffield Tire Protector Co., Dept. 100, Dayton, Ohio



HALLADAY BUMPERS



**The New
HALLADAY
MULTIPLE
SPRING BAR**

The Big Winner of the Year for Live Dealers

The experienced car owner instantly recognizes its mechanical qualities and efficiency, and everyone appreciates its thorobred lines and beautiful finish.

Get busy now and get the business of your vicinity; write your jobber or the nearest distributor.

L. P. HALLADAY COMPANY, Streator, Ill.

DISTRIBUTORS:

ASCH & CO., 16-24 West 61st Street, New York City.
GRAY-HEATH CO., 1440 Michigan Avenue, Chicago, Ill.

HUGHSON & MERTON, Inc., San Francisco, Los Angeles, Portland and Seattle, Pacific Coast Distributors.

E. L. THOMPSON CO., 817 Boylston Street, Boston, Mass.
SANFORD BROTHERS, Chattanooga, Tenn., Southern Distributors

When Writing to Advertisers, Please Mention Motor Age

Haywood's



Nationally
Advertised

Tire Repair and Vulcanizing Service

In these days of high tire prices, the tire repair business is getting bigger and better than ever, as motorists learn the method of true tire economy. **Why not cash in on this opportunity?** Put in a Haywood Tire Repair Plant. Link up with a nationally advertised tire repair service. Six years of Haywood's advertising has standardized the Haywood method.

The Sign of the Man and Machine

—is the connecting link between the tire repair man and the automobile owner. It chains the established trade of hundreds of customers to your business. It connects your shop with a national tire repair service—a standardized service—a service that motorists know absolutely to be economical, practical and efficient.

The Haywood System

—is scientific—a true system of conservation of tires—a system that saves motorists thousands of dollars on tire bills. It means repairs that are lasting—vulcanizing that holds—repairs that are solid as the original tire itself, insurance to motorists of no regrets on the road.

Haywood's Tire Repairing and Vulcanizing Plants

The Haywood Plants are complete, all in one unit—are easily operated—no experience necessary. Here is your opportunity to make big money—to add hundreds of dollars in profits a year to your business. Occupies only a small part of your shop—can stand right out in the open where your customers can see it—a constant reminder to keep their tires repaired. Your shop equipped with a Haywood Plant is the motorist's logical haven for tire repairing. It completes your service—a service that customers like—a service that brings and holds business at big net profits.

Write for New Catalog

Use a letter, or post card, or simply send the coupon below. This brings the big book of facts—tells all about tires and how to repair them—shows outfits in use—gives proof of successes—shows how we co-operate with plenty of advertising and plenty of help—how you link up with a national service. Book gives complete details. Write today. Don't delay.

THE HAYWOOD TIRE & EQUIPMENT CO.

720 N. Capitol Avenue

Indianapolis, Ind.

Haywood Tire & Equipment Co.,
720 N. Capitol Ave., Indianapolis, Ind.

Gentlemen: Please send me full particulars of your national service of tire repairing and complete catalog and information of Haywood Tire Repair Plans.

Name

Address



to start a cold motor.

The LUNKENHEIMER PRIMER will inject the necessary charge of atomized gasoline directly into the intake ports, from where it enters the cylinders, giving a power impulse on the first turn.

No need to waste the starter battery spinning the motor, trying to vaporize the gasoline at the carburetor.

The saving in battery energy alone will in a short time more than offset the cost of this efficient device. Besides, by its use, you have the additional advantages of convenience and safety—convenient, because it is mounted in the cowl within easy reach of the driver and is always ready for use, and safe, because the gasoline is not exposed to the atmosphere.

The LUNKENHEIMER PRIMER is easily attached to any make of car and all necessary connections are furnished.

Booklet No. 513-CH tells the story in detail. Write for a copy, mentioning make of car.

THE LUNKENHEIMER CO.

"QUALITY"
Largest Manufacturers of
High-Grade Engineering Specialties
in the World

CINCINNATI

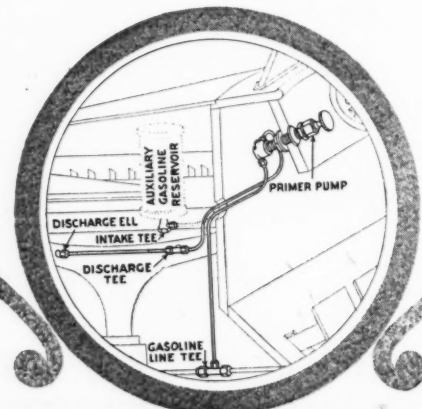
New York

Chicago

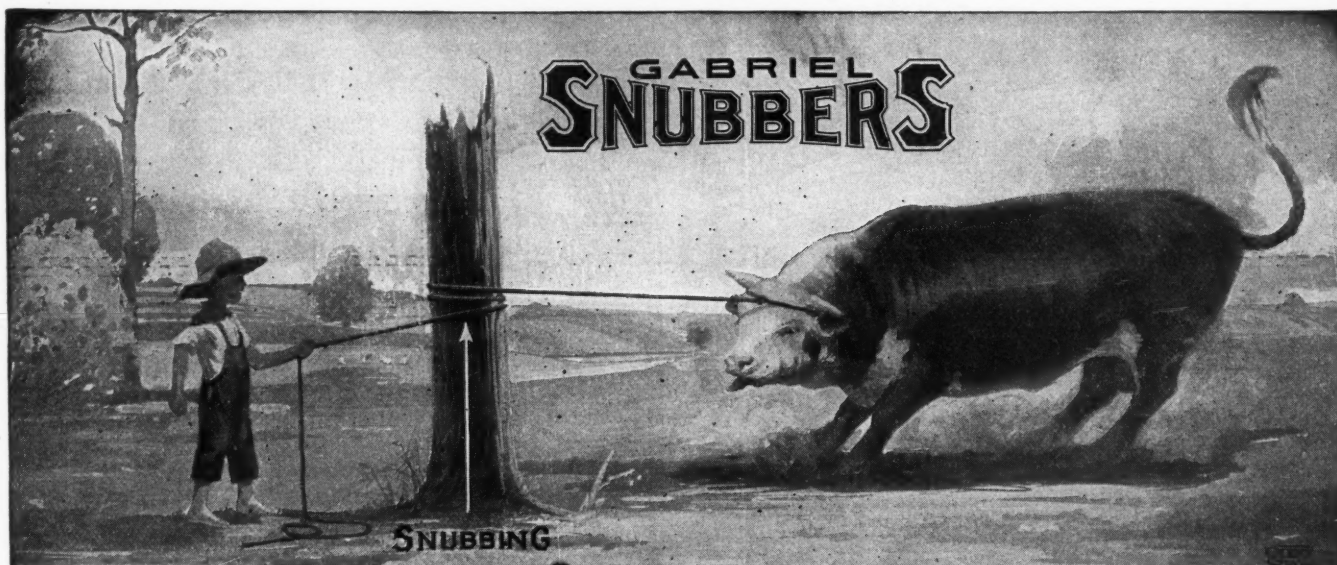
Boston

London

35-14-38



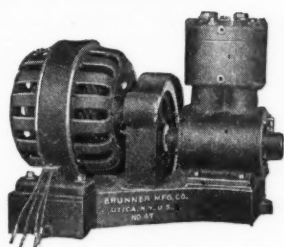
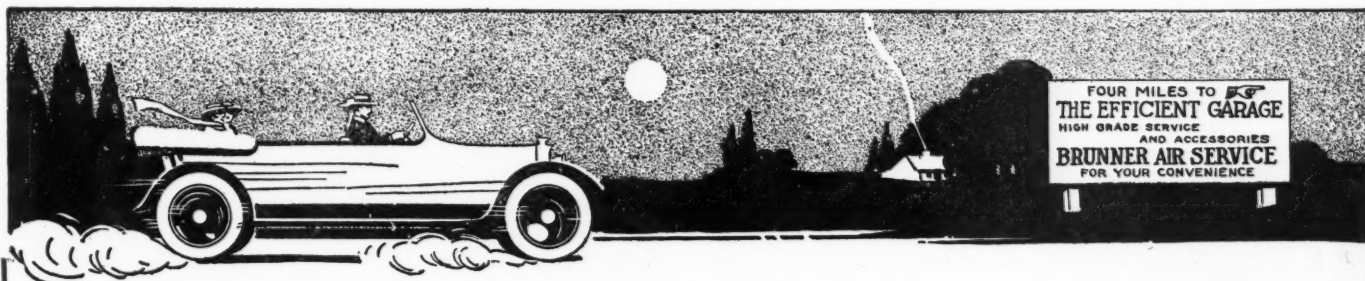
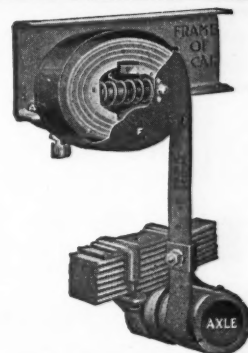
When Writing to Advertisers, Please Mention Motor Age



It's the Coil That Does the Work

When the Bull pulls, the coils tighten and hold him. When your car starts to rebound, the coils of the Snubber tighten and prevent abrupt or excessive upswing of the springs. That makes the car ride easier and prevents spring breakage.

GABRIEL MFG. CO., 1415 E. 40th St., Cleveland, Ohio



The motorist who drives his car during the winter months knows that the severe jolts and jars his tires are subjected to on the frozen ruts and ridges of the roads during the winter necessitate even more careful tire inflation than during the summer months, and he favors Brunner Air Service because he knows it is a dependable and efficient service—

Investigate the BRUNNER Air Compressor

If you do not find the Brunner Line in your jobber's catalogue we will be glad to send you the name of the Brunner Jobber covering your territory and one of our complete catalogues and Garageman's Handbooks on Compressed Air.



BRUNNER MANUFACTURING COMPANY
Main Office and Plant
UTICA, N. Y.

Cincinnati Branch
CINCINNATI, OHIO



Save Gasoline

PATRIOTISM as well as pocketbook is urging motorists to install gas-tight piston rings and *stop fuel waste*. We are hammering home this fact with full pages and half pages in the "Saturday Evening Post," "Literary Digest," "Colliers," emphasizing that

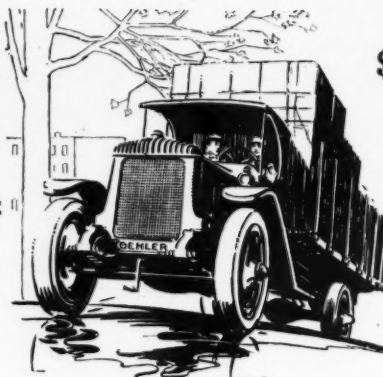
Inlands save from \$5 to \$10 per set over any other type of gas-tight ring.

Our proposition is a business builder for you. Write us! Ask your jobber for terms on Inlands

INLAND MACHINE WORKS
803 Mound St., St. Louis, Mo., U. S. A.

INLAND
1 PIECE PISTON RING

5 H. P.
Valve-in-
Head Motor
STROMBERG
CARBURETOR
EISEMANN
MAGNETO
129" Wheelbase
TORBENSEN
Interval Screw
Rear Axle



\$1150
CHASSIS

"FORTY-FIVE MINUTES FROM BROADWAY"
you will be welcomed during Show Week at the factory of the

KOEHLER
TRADE MARK

TON AND A QUARTER
The "Go Getter" Truck
and 3-Ton Tractor
"The Land Tugboat"

We would be glad to have dealers plan ahead to visit our factory at Newark. We shall be pleased to personally meet you or make arrangements to facilitate your trip to our plant. Such a visit will, we feel sure, prove mutually pleasant and advantageous. Will you give us an idea of the approximate date that would best suit your convenience.

DEALERS—Send for Our Selling Plan

H. J. Koehler Motors Corporation
158 Ogden Street, Newark, N. J.

(PATENTED)

Two views of the R & M Conform Piston Ring, a cross section view and another of the entire ring, showing outer and inner sides.

There is no suspicion of a "gap." The breaks in the rings are 120% apart. Leakage is impossible.

MODERN ELECTRIC & MACHINE CO.
INDIANAPOLIS, IND.

**This sign in
YOUR window**



hooks
you up
with the
advertising
and reputation of



Tuthill Titanic Lubricated Springs

Motorists know that the "Service Sign" pictured above means break-proof springs and 'top notch' spring service. They look for it on the dealer's window—it *brings and builds* business.

More spring replacements are made with Tuthill Titanics than all other makes put together.

Tuthill dealers are not required to carry heavy stocks of springs. Our distributors located at convenient points in every part of the United States carry *complete stocks* ready for immediate shipment.

Our proposition to dealers will interest you—write for it and name of nearest distributor. Ask for this business building sign and our poster price list.

Tuthill Spring Company

760 Polk Street

(Established 1880)

Chicago, Illinois



Engine-Driven Tire Pump

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And small size, light weight, few parts and simplicity mean low production-cost.

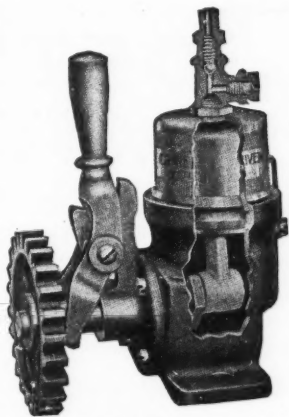
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The full story of the CRANE and its patented Packing-Ring is told in an interesting little Folder—just off the press. Write for FREE copy today.

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75 To 80 Miles An Hour From Your Ford With These Peugeot Type Cylinder Heads

Your Ford will ramble faster than you can drive it on the road—and it will step away ahead of ordinary Fords on the race course equipped with ROOF'S Peugeot-Type Cylinder Heads, and 3 to 1 gear ratio.

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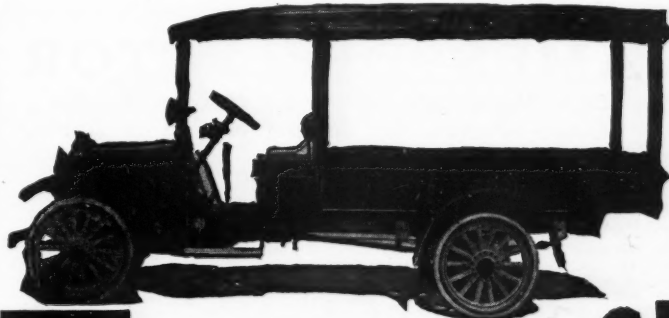
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610 Meridan Street, Anderson, Indiana

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1 Ton Trucks
**A Year Ahead
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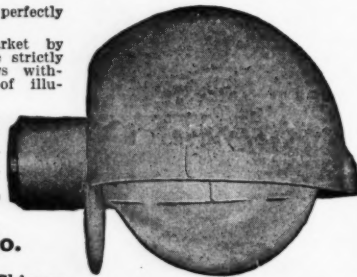
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GIVES GOLDEN SERVICE
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AND
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Write for specifications of different types and sizes

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TRANSMISSION CHAIN

For Motor Trucks and Tractors

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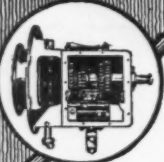


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Chains Keys and Cutters Hand Milling Machines

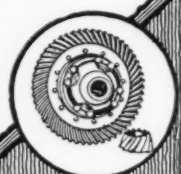


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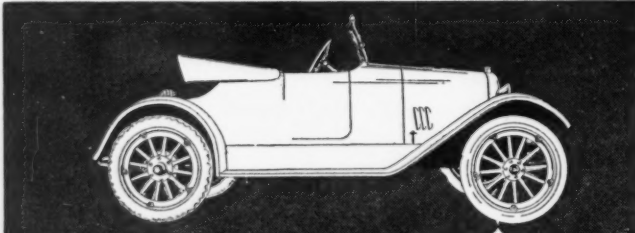
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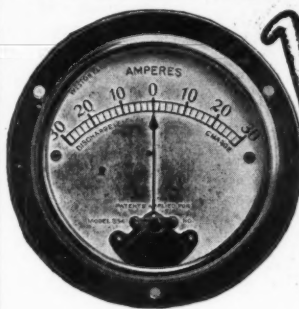
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Makes A
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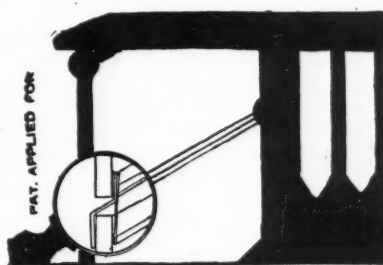
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10,000
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Miles

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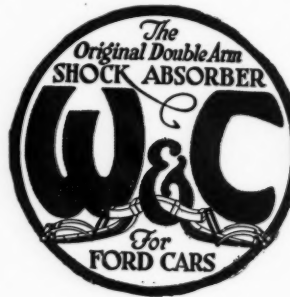
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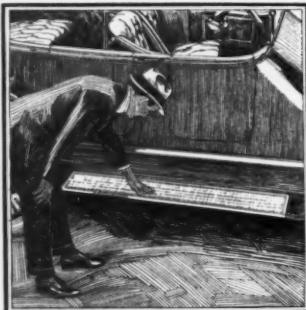
He knows the only
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Fords that does more
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You Want
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You'll find real sheet aluminum running boards on the Inter-State. They wear better and keep the car looking bright and new. There are no "Make Shifts" used in Inter-State construction.

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\$950 to \$1025

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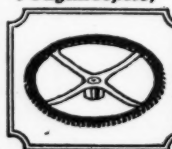
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Turn Waste Space and Spare Time into Big Profits

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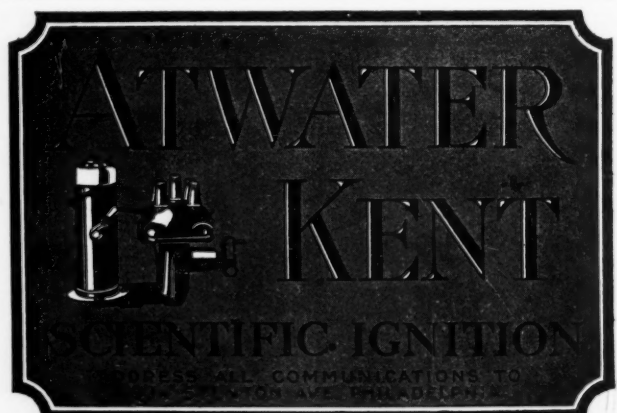
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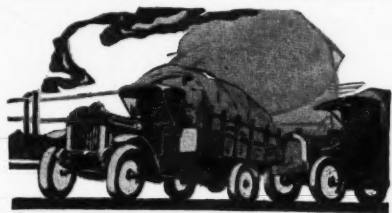
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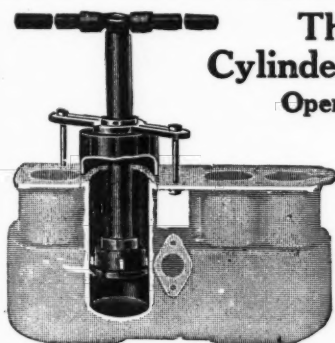
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Savings you can make will please your patrons and pay good substantial profits.

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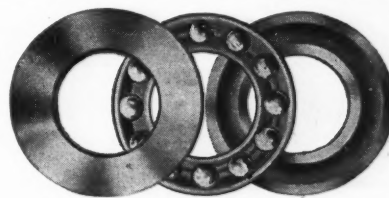
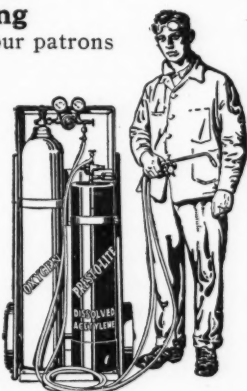
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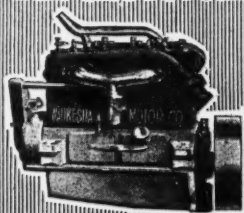
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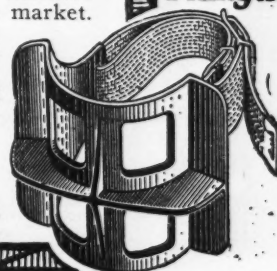
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Exceptional
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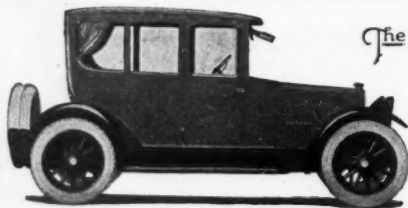
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TRUCK

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Union Arcade, Pittsburgh, Penna.



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KISSELKAR
4 Passenger
Sedan

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EVERY INCH A CAR

Basline Autowline

The Original Wire Rope Towline

For Sale by all Dealers

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BETHLEHEM MOTOR TRUCKS

"Dependable Delivery"

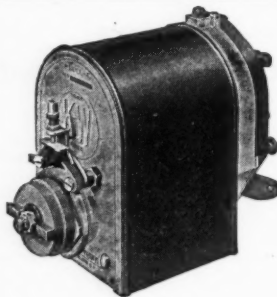
1 1/4 ton Chassis \$1245 2 1/4 ton Chassis \$1775
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MODEL T or T K
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this test becomes a day after day performance. K-W users need no batteries at any season—and can use any kind of fuel. That means economy and convenience.

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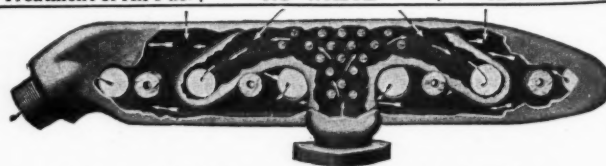
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Exhaust and Pins
Assure Uniform Heat
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This Hot-pin Chamber
Breaks Up all the Fuel
NO WASTE

Exhaust Gases Heat
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40% to 50% increase in gasoline mileage
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low-grade fuel by pre-heating mixture.

Price \$15 Complete. Send for Literature. Dealers Wanted.

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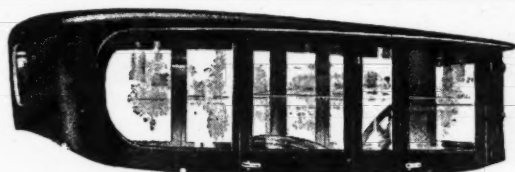
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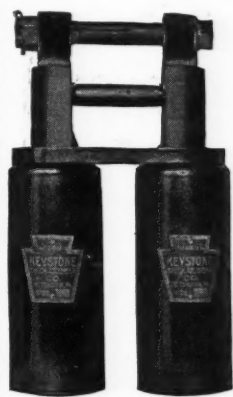
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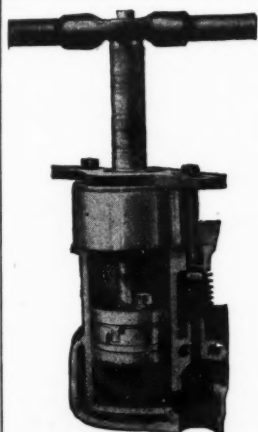
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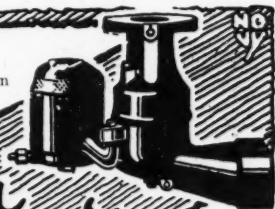
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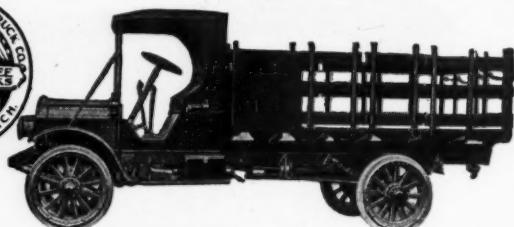
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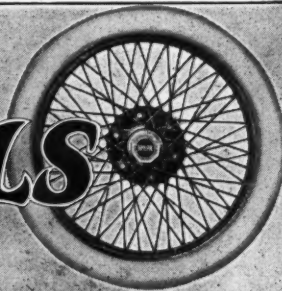
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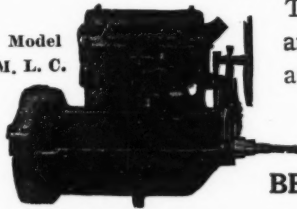
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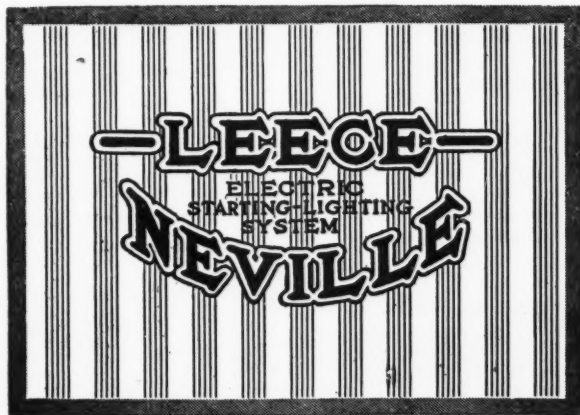
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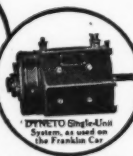


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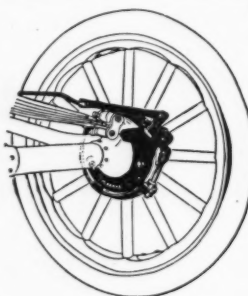
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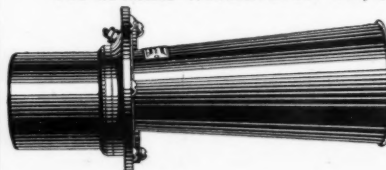
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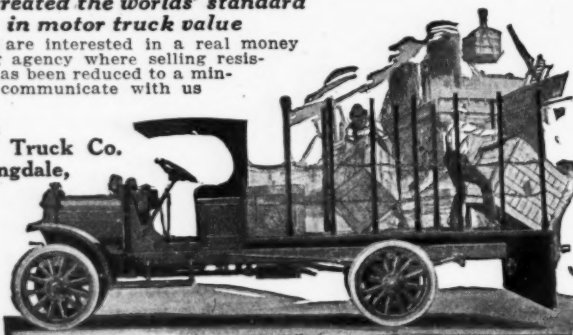
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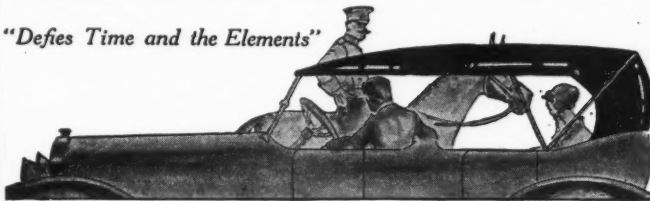
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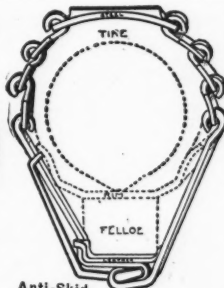
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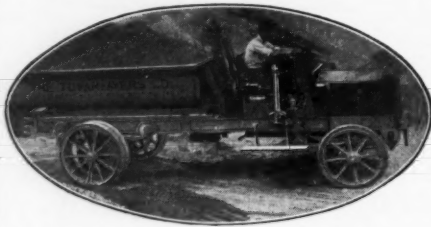
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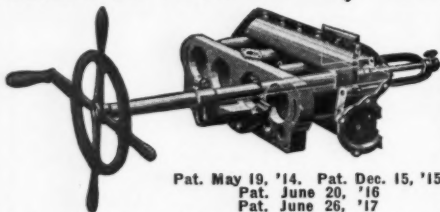
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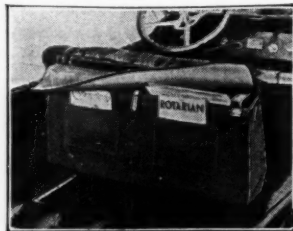
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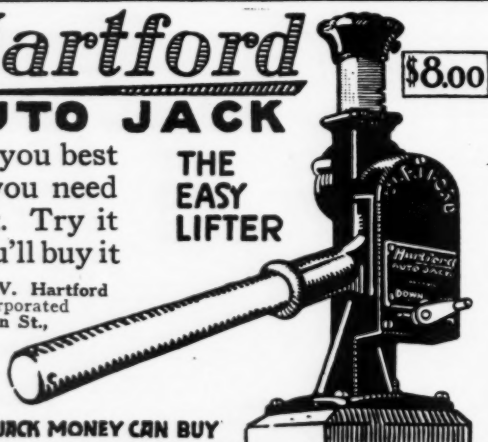
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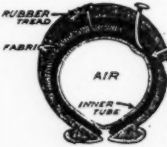
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STANDARD OR ORPHAN MAKE—Apperson 1912, Buick 16-17-25-10-F, Cadillac 1909-10-11-12-13, Carter Car 1909-K, Chalmers 36-40, Cutting T35-T55, Detroit, E.M.F. 30, Michigan, Firestone, International (Highwheel, 1,000 lbs.), Krit, Moon, Overland 39-59-60-41-69, Regal, Reo (2 cyl.) 1912, Rambler, Stoddard Dayton, Oakland 30-40, Carnation, R.C.H., Jackson 35, Hudson 33, Abbott-Detroit, Cartercar, model L. If

you do not find make you desire listed above, write. We have many others.

MOTORS—\$25.00 and UP—Cadillac 9-10-11-12-13, Buick 16-17-25-10-F, Apperson 1912-13, Carter Car, '09, Chalmers '09, Cutting T35-T55. E.M.F. 30, Regal 1912, Reo (2 cyl.) 1912, Rambler 1912-13, Krit 1912, Moon Mod. 30 & 40.

MAGNETOS—Bosch, DU4's, \$25.00; DU & Dual DR4's, \$30.00; DU & DR6's Dual, \$35.00; Low tension magnetos, \$3.00 and up.

REAR AXLES—More than 50 different makes, \$15 and up.

CARBURETORS—\$5.00 and up.

BEARINGS—\$2,000 stock, best prices; absolutely guaranteed.

RADIATORS—More than 50 at \$10.00 and up.

Write for our catalog.

THE WYCKOFF SALVAGE CO., of Sioux City, Iowa

When Writing to Advertisers, Please Mention Motor Age

FACTS EVERY CAR OWNER SHOULD KNOW BEFORE BUYING USED PARTS

THE AUTO PARTS CO., Inc.

ST. LOUIS, MO.
DAVENPORT, IOWA

We wreck cars that we could sell second handed.
We have a department to inspect all parts.
We have a method of racking parts that is perfect.
We never lose a customer.

TO OBTAIN GOOD PARTS.
TO OBTAIN ONLY GOOD PARTS.
TO ASSURE PROMPT SERVICE.
WE DELIVER THE GOODS.

For the following makes of cars and many others we have complete parts:

Buick, Models 10-17-19-25-29-27-14-39-40; Chalmers, Models F-K-M-30-36-40; Cadillac, Models 1909-1910-1911-1912; Maxwell, Models A-AA-AB-D-K-E-I-G-22 Mascotte and Special 2; Mitchell, Models T-R-K-H-S 6 cyl. 1912, 6 cyl. 1915; Overland, Models 30-31-38-49-42-52-59-41-69-80. Studebaker, Models EMF 30; Flanders 20-4-14-1915-25 and 1913-25; Auburn 1911 and '12, Bergdoll, Chase, Courier, Crow Elkhart, Dorris, Elmore, Everett 30, Glide, Garford 30 & 40, Jackson 35 & H, Jeffery, Krit, Lozier, Marion 1912, Moline, Midland, Marathon, Moon, National, Ohio 1910, Oakland 25 & 40, Olds, Perry, Premier 6, Packard 1907 to '10, Rapid Truck, Regals 1909 to 1914, Ramblers, Reo 1910 & '11, R. C. H., Studebaker 35, Staver 1913, Stoddard-Dayton, Velie '10-40 & '13, Cole 30, 40, Paige, 25-36, Stutz, Imperial, Stearns and Stearns-Knight.

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We have received a shipment of ten tons of Gears for all makes of cars. Send us your old Gears and let us match them. UNHEARD-OF BARGAINS.

Gears

Gears

MOTORS

COMPLETE ENGINES—Mitchell 6, 1912, \$100; Flanders 20, \$50; Cadillac 1909, \$65; R. C. H., \$50; Overland 42, \$80; Mitchell T. 1911, \$75; Cadillac 1912, \$90; E.M.F. 30, \$50; Kline 6 cyl., \$125; Hudson 33, \$125; Jeffery, \$100; Imperial, \$125; Premier, 6 cyl., \$125.

Will sell most any part from these engines. We have a large stock of engines and will trade engines with you.

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Our catalog is ready for your inspection. Write today for same. Not only will this list the stock on hand, but it will aid you in ordering any parts that you may need, for it explains all in detail, and if you will follow instructions, it will do away with all delay. When you want the right goods at the right prices wire, phone, write.

THE AUTO PARTS COMPANY (Inc.), St. Louis, Missouri, Davenport, Iowa

We Tear 'Em Up and Sell the Pieces

GUARANTEED REPAIR PARTS AT A SUBSTANTIAL SAVING!

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Overland 69	75.00
Overland 71	75.00
Overland 79	75.00
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Case 1911	75.00
Stearns 1911	75.00
Studebaker 35	75.00
Moon 1912	75.00
Velie 40, 1912	85.00
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Buick 17	90.00
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Velie 4-1915, with Starter & Generator	150.00
Apperson 8 cyl. with starter	200.00
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All Motors Guaranteed in Excellent Condition

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Winton Six 4 speed	50.00
Firestone Columbus, Center Control	30.00
Reo, 1912, Center Control	35.00
Chalmers-Detroit, model J	30.00
Velie R. H. control	35.00
National 1910, 40 H. P.	35.00
Kissel 40 H. P.	35.00
Kissel 50 H. P.	35.00
Peerless	40.00
Pierce-Arrow	40.00
Mitchell 40 H. P., Center Control	30.00
Apperson Center Control	40.00
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Remy Magneto & Coil	10.00
Simms H. T.	15.00
Splitdorf Dixie	20.00
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Bosch DU4, Set Spark	25.00
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Bosch DU4 Variable Spark	30.00
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Radiators	10.00 to 25.00
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Spring Leaves	.25 to .50
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We have parts for 100 different models. Let us know what you need.

For Instant Service, Wire, 'Phone or Write

"We Tear 'Em Up
and Sell the Pieces

AUTO WRECKING COMPANY

13th & Oak
Kansas City, Mo.

When Writing to Advertisers, Please Mention Motor Age

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DOWN GO PRICES BELOW
COST

Enormous Stock of Material Purchased at Auction from the Auto Parts Co., Chicago, Ill.
Chicago, Ill.

Write for our special bankrupt stock price list of

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Special Prices in Quantities

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Good, heavy, large size wool robes, exceptional value at, up.....\$5.19

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King's official road guides for all states. Regular \$1.00 value.....\$0.39

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All makes; all sizes for all cars, up.....\$3.00

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We have all makes and sizes in stock, up.....\$3.00

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Many makes, up.....\$50.00
Steering gears—Gemmer and Jacox, up.....10.00
Auto-Lite generators, 6-volt G.G. and G.F.12.50
Carburetors—Stromberg, Rayfield, Schebler, Holly, Carter, up.....3.95
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Maxwell touring car bodies, brand new; all complete—will fit many light cars.. 35.00

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Speed up the Ford—Special ring gears and pinion; set.....12.00
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All Parts for All Cars

410 LaFayette Blvd., DETROIT, MICH.

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INDIANAPOLIS INDIANA

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LOWEST PRICES ON

Good Serviceable

PARTS

FOR ALL CARS. WHY?

Because we are the biggest wreckers in Chicago, the center for wrecked cars. Because we market our scrap material to big local foundries. If we cannot satisfy you, money cheerfully refunded.

SPECIAL MOTOR BARGAINS

All in excellent condition.

4 cyl. 1914 Mitchell.....	\$100.00
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6 cyl. Stevens-Duryea, complete Unit Power Plant.....	150.00
4 cyl. 1913 Abbott-Detroit Unit Power Plant with Starter and Generator.....	150.00
Paige 25.....	45.00
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Liberal Allowance Made on Your Old Motor	

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DU 4 Set Spark.....	\$16.00
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All kinds of Starters and Generators at attractive prices. Silent Starter and Generator Chains; all lengths and sizes.	
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Parts and Repairs.

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This we have not answered once, but thousands of times, as we maintain in stock a complete line of parts to fit over fifty (50) different makes of cars, not on some second hand or cast-off material, but absolutely brand new parts, and being made of the same material that was installed at the time car was manufactured.

In order to give effective service, it is necessary for us to carry a very large stock, as the demand is steadily increasing and cars are wearing out daily. This, together with the present shortage of raw material, makes it an important factor that we give every order prompt and immediate attention.

We therefore solicit any inquiry that you may have with regard to your requirements and, as stated above, our service aims are Attention, Courtesy and Speed.

BULLETIN No. 39

Jos. C. Gorey & Co.

356 W. 50th St.

New York City

Parts and Repairs.

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We carry in stock for immediate shipment transmission gears and shafts, rear axle gears and shafts, for the following makes of cars:

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AUBURN	MICHIGAN
BADGER	MIDLAND
BERGDOLL	MILLER
BERKSHIRE	MOON
BUICK	MOLINE
CADILLAC	MOYER
CARHART	NYBERG
CASE	OAKLAND
CARNATION	OHIO
CHALMERS	OMAHA
CHEVROLET	OVERLAND
COLE	PAIGE
COREJA	PALMER-SINGER
COURIER	PARRY
CRESCENT	PARTIN-PALMER
CROW	PATHFINDER
CROXTON	PENN
CUTTING	PATERSON
DAVIS	PILOT
DE TAMBLE	R. C. H.
DIAMOND	REGAL
DOLSON	REPUBLIC
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EMPIRE	SCHACHT
ENGER	SELDEN
EVERETT	SIGNAL
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FLANDERS	STUDEBAKER
GLIDE	STUTZ
GRANT	SPHINX
GREAT WESTERN	STANDARD
HALLIDAY	SUBURBAN
HAYERS	THOMAS-DETROIT
HENDERSON	VELIE
HENRY	VIRGINIAN
HUDSON	WARREN
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K-R-I-T	

All parts are new, and fully guaranteed as to material, workmanship and fit. 90% of our prices are from 10 to 50% below factory prices, never any higher. Liberal discount to garages and repairmen. 190 Page price list upon request. No repair shop complete without it.

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Auto Parts

FULL STOCK OF PARTS FOR
Michigan, Lozier,
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We maintain a complete stock of parts
for the above cars

Philadelphia Machine Works
67 Laurel Street, Philadelphia, Pa.

Parts and Repairs.

WE HAVE THE PARTS

You Have Been Looking For
50 to 80% Off
Manufacturer's List Price

A partial list of cars for which we have parts for practically every model:

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APPERSON	MATHESON
AUBURN	MAXWELL
BUICK	MAXWELL-MASCOT
CADILLAC	MITCHELL
CARNATION	NYBERG
CASE	NATIONAL
CARTERCAR	OAKLAND
CHALMERS	OLDSMOBILE
COLE	OVERLAND
COLUMBIA	PACKARD
CONTINENTAL	PAIGE 25 & 36
CUTTING	PATHFINDER
DAVIS	PAIGE-DETROIT
DE TAMBLE	PEERLESS
DETROITER	PIERCE-ARROW
E. M. F.	PILOT
EMPIRE	PREMIER
EVERETT	RAMBLER
FLANDERS	R. C. H.
GREAT WESTERN	REO
HAYNES	RICHMOND
HUDSON	SAMPSON
HUDSON "6"-54	SILENT-KNIGHT
HUPMOBILE	SPEEDWELL
KISSEL KAR	STEARNS
KRIT	STODDARD-DAYTON
LITTLE	STUDEBAKER
LOCOMOBILE	WAYNE
LOZIER "4"	WESTCOTT
LYONS-KNIGHT	WINTON
McFARLAND	ZIPP

Magnetos, Motors, Transmissions, Rear Systems. We have parts for many make machines too numerous to mention here. We wreck cars daily. When ordering, state model and year of your car, if possible, also send your old part.

ALL ORDERS FILLED ON DAY RECEIVED

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We can furnish supplies cheaper than any house in the country, because we buy up job lots, auction sales and failures. It will pay you to send for our bargain sheet.

Rear Tire Holders, Ford.....	\$ 2.50
Benjamin Magneto Rechargers, Ford....	3.25
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Electric Starters	20.00
6 Cylinder Motors	65.00
4 Cylinder Motors	35.00
Sliding Gear Transmissions.....	30.00
Steering Gears	6.00
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Crown Fenders, per set.....	10.00
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Drexel 5-passenger cars, complete, upholstered and painted and assembled, less tires, motor and transmission....	190.00

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\$13.00

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\$13.00 crated, F. O. B. Chicago

AUTO REMODELING CO.

1501 Michigan Avenue Chicago

Parts and Repairs.

Parts and Repairs.

Parts and Repairs.

BUY GUARANTEED AUTO PARTS—FOR ALL CARS

From

MAXWELL BROS.

3921-23 Olive Street, St. Louis, Mo.

Save 50% to 75%

Stop buying junk that never does or never can give satisfaction. We protect you. We guarantee our parts to be right, and what's more, we further guarantee that our prices will be as low as those quoted by any other house in America. We believe in small profits and big sales. Some day you will buy from us. Why not NOW?

We Have in Stock, PARTS for All Models and Makes of AUTOMOBILES
OUR STOCK CONSISTS OF:

Motors, Transmissions, Axles, Crank Shafts, Crank Cases, Cylinders, Cam Shafts, Transmission Cases, etc. Below is a partial list of cars for which we can supply all parts:

Cadillac 1909 to 1913	Maxwell, all models to 13	Atlas-Speedwell	Pratt-Firestone-Columbia
Chalmers 30—F. K. M.	Packard, 1905 to 1912	Mitchell, 1908 to '14	Michigan-Halliday
30-40—Master Six	Pierce-Arrow, '07-'12	Thomas, all models	Apperson-Marion
Studebaker—Garford	Hudson 20, 33, 37, 6-54	Great Western—R. C. H.	International-Staver
E.M.F. 30—Flanders	Ohio-Regal	Oldsmobile Special	Lozier—4 & 6
Dorris, 1906 to '09	Bergdoll-Staver	Limited-Autocrat	Winton 6
Peerless, 1906 to '13	Allen, '15 and '16	Defender-42 and 43	Metz
Stoddard-Dayton	King, '11-'12-'13	American Underslung 30	Empire
Cole, 4-50-1913; 6-1913	Palge 25-36—Empire 25	to 50—Scout	Premier 4 & 6
30-1912; 40-1914	Standard 6—Metz	Case 40—Holliday	Atterbury
Marmon, 1909 to 1912	Stevens-Duryea	Haynes—Carter Car	Alco
National 4, '10 to '13	Midland-Wayne-Welch	Overland 38-40-41-42-45-	Commercial Truck
Franklin, '05 to '11	Selden-Speedwell	46-51-54-55-56-59-60-	Knox
Hupp 20 K	Stearns, 30 to 60	69-71	
Glide-Warren	Kissel 4-6		
Locomobile—Knox	Matheson 4-6		
Interstate—Jackson	Amplex, all models		
Abbott Detroit	Pope Toledo—Winton 6		
Courier-Glide	Oakland 30 & 40		
Buick, 10-17-19-30	Pope Hartford		
Moon 30-40-45 & C	Reo, '08 to '13		

We GUARANTEE a square deal, prompt service, and absolute satisfaction or you get your money back.

LOOK AT THESE BARGAINS

GEARS for all cars 50% off list. BEARINGS, 50c and up. AUTO SPRINGS, new and used, for all cars, \$2 up. PRESTO TANKS, B, \$6; E, \$4.50. HAND HORNS, \$2.65. MAGNETOS, Bosch High Tension, \$18.00 and up. RADIATORS, new and used, \$15.00 and up.

PARTS

in stock for practically all cars. Send in your old part, we will duplicate it. Prices reasonable. Quick service. Satisfaction guaranteed of money refunded. We specialize in obsolete models.

MOTORS

Automobile, Marine or Stationary
SOLD OR EXCHANGED

Over 400 in stock of all makes

MAGNETOS

Repaired 24-Hour Service. Best workmanship, lowest prices. Ship us your work for quotation.

FULLINGTON AUTO PARTS

324-26 Grand River Ave. Detroit, Mich.
Phone Grand 5726

TO ALL OWNERS OF Maxwell-Briscoe Stoddard-Dayton Everitt

MAXWELL 6-50 MAXWELL 4-35
FLANDERS "SIX" BRUSH
COURIER-CAR COLUMBIA
COURIER CLERMONT
SAMPSON "35" MOTOR CARS
ALDEN-SAMPSON TRUCKS

The Maxwell Motor Company has transferred to the Standard Motor Parts Co. the entire service departments of all of the models above listed, and all orders for repair parts should be placed direct with the Standard Motor Parts Co., New Castle, Indiana.

Better service will be given than ever before, and many reductions in repair parts prices have been effected.

Address all orders and inquiries direct to the
Standard Motor Parts Company

NEW CASTLE, INDIANA

Save Your Stamps

Your postage isn't wanted when you write us for parts.

We have parts for 220 cars on our shelves, now. Motor Magnetos, Radiators at a saving. Write us your wants. Address

AUTO SALVAGE AND EXCHANGE CO.

301 Jackson St. Sioux City, Iowa

MAGNETOS AND COILS

Guaranteed for One Year
Against Any Mechanical Defects

Magnetos, Coils, Generators and Starters repaired. 24-HOUR SERVICE. Expert workmanship, reasonable prices.

MAGNETOS FOR SALE

Bosch Du-4 variable spark.....\$25.00
Bosch DU-4 set spark.....20.00
Bosch D-4 and Dr-4.....25.00
Bosch D6 and Dr6.....30.00
Splitdorf 4 cyl. Dixie, high tension.....25.00
Splitdorf 4 cyl. Models A, T, X and D.....8.00
Remy 4 cyl., type RD and RL.....10.00
Simms SU4, high tension.....15.00

COILS

Splitdorf T.S.F type.....\$ 8.00
Splitdorf box type.....6.00
Bosch type A.....12.00
Remy box coils.....6.00
Remy type LC and LE.....8.00
Briggs box coils.....6.00

PREST-O-LITE TANKS

Model B., fully charged.....\$ 7.00
Model E., fully charged.....6.00

Remember, 24 Hour Service on Repairs

DETROIT MAGNETO EXCHANGE

Members Detroit Automobile Trade Association
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and fitted with light grey iron pistons, leakless rings and piston pins. Highest quality workmanship, at reasonable prices.

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Our complete records give Permanence and Continued Service

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Over 500 Piston Patterns Always in Stock.

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Highest grade of work, including new pistons and rings for \$5 to \$10 per cylinder. Aluminum alloy pistons furnished at \$1 to \$3 per cylinder extra, light semi-steel pistons at slight advance above cast iron.

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Ford cylinders reground, new rings, bushings and wrist pins for \$10.

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on automatic machinery by skilled mechanics at prices that will interest you. Gears, Axles, Valves and parts of all kinds made of high-grade alloy steel. Send us your worn or broken parts and we will replace them.

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for Self-Starters, Gears of every description cut or made to specifications.

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**Cylinder
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on special highest grade cylinder grinding machinery. No makeshift tools. Work handled by men with automobile factory experience. Large assortment of patterns for iron pistons. Complete stock of piston rings. Prompt service. Highest grade work only, fully guaranteed.

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Aluminite pistons will put six cylinder smoothness into a four cylinder motor; improve a six or eight, give more power and quicker get-away. For prices, state make, model and year. Piston pins, aluminite connecting rods and racing motors.

For Tractors, these pistons will greatly increase the efficiency of the motor and save the bearings.

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Complete stock—new and used—for all makes of cars. Every motor in perfect condition—no junk. We also build and overhaul motors, both automobile and aeronautical. Many a good car proves inefficient, due to motor trouble. We specialize in motor work, often changing a four-cylinder to a six, eight or twelve. Don't discard a car otherwise satisfactory because of motor trouble. Tell us your difficulty and let us solve the problem quickly, efficiently and at a reasonable expense.

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SCORED CYLINDERSWork Guaranteed for the Life of the Motor
24-HOUR SERVICEWARPED AND OVERSIZE CYLINDERS REGROUND AND FITTED WITH NEW PISTONS AND RINGS. WELDING OF ALL METALS.
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OUR PROCESS HAS BEEN USED AND ACCEPTED BY THE LEADING MANUFACTURERS
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No Warping or enlarging of bore. Same piston and rings used. Work guaranteed
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ARE PERFECT

Magnalite or Cast Iron Pistons—SPECIAL—Ford Job \$10.00—Reground—New Pistons
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WE GRIND CYLINDERS FOR \$1.50 AND UP

according to condition of cylinder.

Cylinders reground and fitted with special heat-treated
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We Do All Kinds of Gear Cutting.

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Brake Shoes for Fords, ea.....25c
We make any size piston according to B/P and
are open for contracts. Our pistons and brake
shoes are made of the very finest grain Iron,
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TRUMP MULTIPLE PISTON RINGSare all sold under a Positive Guarantee, the user
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will have no dirty, sloppy engine and spark
plugs. Easy to put on your pistons; have no
pins to break and damage your cylinders.
Ford sizes, \$1.00 each.

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CYLINDERS REGROUND\$5 to \$11 per cylinder, including pistons and rings.
Alloy Pistons, from \$1.50 to \$3.50 per cylinder, extra.
Ford cylinders reground and fitted with pistons, rings,
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TRINDL MACHINE WORKS**Cylinder Grinding**PISTONS — RINGS — WRIST PINS
61 East 24th Street, CHICAGO, ILL.**CYLINDERS**

Reground—We Weld Anything

Fitted with cast iron or light pistons;
leak-proof or plain piston rings.
Best equipped shop in the country.Quick Service—Reasonable Prices—Gear Cutting
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insuring absolute accuracy and the highest attainable
quality of finish. Special heat-treated extra light new
pistons, and re-turned rings fitted without extra charge.
Wrist pins to order. Reboring, autos, \$4.50 to \$9.50 per
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CYLINDER GRINDINGwith light semi-steel or aluminum alloy
pistons

Get Our Special Prices

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Quick service, satisfaction guaranteed.

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Patterns for nearly all makes of cars in stock,
which assures prompt service. Prices right—
work guaranteed. We Solicit a Trial.Erie Auto Engineering Co., Inc.
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Your business for December should
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\$6 to \$7 per cylinder. All our work guaranteed.
Quick shipments. Let us prove our ability on
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either cast iron pistons and rings or our special light
alloy pistons and rings furnished. Best workmanship.
State make of car in writing.CRANKSHAFTS REGROUND on special crankshaft
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2201-2209 Campbell Ave. KANSAS CITY, MO.**NEW TIRES & TUBES** ALL FRESH STOCK
STANDARD MAKES

Slightly Mould Blemished Tires.

Size	Tires	Tubes	Size	Tires	Tubes	Size	Tires	Tubes	Size	Tires	Tubes
28x3.....	\$7.25	\$1.75	31x4.....	\$14.10	\$2.80	36x4.....	\$16.70	\$3.25	35x5.....	\$24.65	\$4.00
30x3.....	7.10	1.80	32x4.....	14.35	3.00	34x4½.....	20.65	3.30	36x5.....	20.00	4.10
30x3½.....	9.20	2.00	33x4.....	15.00	3.00	35x4½.....	21.60	3.35	37x5.....	26.10	4.20
32x3½.....	10.75	2.25	34x4.....	15.35	3.10	36x4½.....	22.00	3.40			
34x3½.....	12.50	2.50	35x4.....	17.50	3.10	37x4½.....	22.50	3.50			

SLIGHTLY USED AND DEMONSTRATING TIRES

REAL VALUES—NO JUNK

28x3.....	\$3.50	32x3½.....	\$6.50	32x4.....	\$7.50	35x4.....	\$8.00	35x4½.....	\$9.50	35x5.....	\$10.00
30x3.....	4.00	34x3½.....	7.00	33x4.....	8.00	36x4.....	8.50	36x4½.....	9.50	37x5.....	10.50
30x3½.....	5.00	31x4.....	7.00	34x4.....	8.00	34x4½.....	9.50				

All other sizes in proportion.
Upon receipt of 10% of the amount of your order, goods will be shipped you promptly; balance
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NEW-IDEA TIRES

Real Tires That Give
REAL MILEAGE

GET THESE PRICES

Send us two worn out tires

AT OUR EXPENSE

no matter how bad and for the following prices we will send you, C. O. D. anywhere, a real non-skid tire, NOT sewed on stuff, but real

NEW LIVE RUBBER

If your old tire is worn too much, we junk it and furnish one instead.

30x3	\$5.50	34x4	\$9.90
30x3½	6.00	35x4½	12.00
31x4	7.15	36x4	11.25
32x3½	7.70	36x4½	12.65
32x4	7.95	35x5	13.00
33x4	8.75	37x5	13.75

Let us RE-TREAD your tread-worn tires and be convinced. Some of our customers have gotten 5,000 miles additional out of their old tires.

Dealers, write for proposition

The New-Idea Tire Company
1343 W. Girard Ave., Philadelphia, Pa.

Popular Priced TIRES

Various Makes

Factory Firsts & Seconds

Size	Plain	Non-Skid	Size	Plain	Non-Skid
28x3	\$ 6.45	\$ 7.45	35x4	\$13.95	\$15.45
30x3	6.95	7.95	36x4	14.95	16.00
30x3½	8.45	9.45	34x4½	17.45	19.45
32x3½	9.45	10.40	35x4½	17.95	19.95
31x4	11.95	13.10	36x4½	18.45	20.45
32x4	12.45	13.45	37x4	18.95	20.95
33x4	12.95	14.00	35x5	19.95	22.45
34x4	13.45	14.45	37x5	20.95	23.75

We Pay Express Charges

Special Proposition to Good, Live Dealers

ATLAS TIRE COMPANY

822 N. Broad St.

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Save Money

—LET US TIRE YOU—

AND YOU WILL NOT TIRE BUYING TIRES
GUARANTEED STANDARD MAKES
at Wholesale Prices—Write Today for Prices
WHOLESALE TIRE EXCHANGE
2206 Michigan Ave. Chicago, Ill.

Tires.

Tires.

"The Hester Tire Gives Better Service Than Any I Have Used"

R. E. GORDON, M.D., of El Paso, Ill., writes:

*"I have driven over 200,000 miles
in different cars I have owned, using
several different makes of tires.
THE HESTER TIRES GIVE BET-
TER SERVICE THAN ANY I
HAVE USED."*

Remember our 5000-Mile Guarantee—Remember that every tire is new, high quality, absolutely free from imperfections—and

Then Look at the Prices!

Net Prices—Effective October 20, 1917

SIZE	PLAIN	NON-SKID	TUBES
30x3	\$10.70	\$11.85	\$2.55
30x3½	13.85	15.30	2.95
32x3½	17.15	18.60	3.10
33x4	22.15	24.55	4.45
34x4	22.50	24.85	4.55
34x4½	30.40	33.65	5.70
35x4½	31.30	34.65	5.80
35x5	37.10	41.15	6.75
37x5	39.10	43.35	7.00

Other sizes on request.

Prices subject to change without notice.

5000-Mile Guarantee

A 5000 mile guarantee accompanies every Hester Tire and holds good for the life of that tire no matter how many miles or how many days it has traveled.

Hester Tire & Rubber Co.

5200 Euclid Ave.,

Cleveland, Ohio

MAIL THIS COUPON TODAY!

The attached coupon (filled out and mailed to us) will bring you full particulars.

HESTER TIRE & RUBBER CO.,

5200 Euclid Ave., Cleveland, Ohio.

Dear Sirs:

Please send us complete information relative to your method of selling tires, and tell me how I can save money on the very next tire I buy.

Name

Address

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Tires.

Tires.

Tires. Magnets and Service Stations.

ECONOMIZE ON YOUR NEXT YEAR'S TIRE BILL NEW GUARANTEED TIRES AND TUBES 3,500 MILE GUARANTEE—Adjusted on a Mileage Basis

We are offering a large number of first class TIRES and TUBES at prices that will pay you to buy, previous to our taking Annual Inventory. Send in your order now as these prices are Good for a limited time only.

Size	Tire	Tube	Size	Tire	Tube	Size	Tire	Tube
28x3.....	\$ 7.25	\$1.25	31x4.....	\$14.50	\$1.50	36x4½.....	\$21.50	\$2.00
30x3.....	7.25	1.25	32x4.....	15.00	1.75	37x4½.....	25.00	2.50
30x3½.....	9.50	1.40	33x4.....	15.50	1.75	37x5½.....	27.00	2.50
32x3½.....	10.75	1.40	34x4.....	16.00	1.75	38x5½.....	30.00	2.50

Add 10% for Non-Skid

REAL BARGAINS IN

SLIGHTLY USED TIRES AND TUBES

All in Excellent Condition

Size	Tire	Tube	Size	Tire	Tube	Size	Tire	Tube
30x3.....	\$5.00	\$1.00	32x4.....	\$ 8.00	\$1.50	35x4½.....	\$10.00	\$1.75
30x3½.....	6.00	1.00	33x4.....	8.50	1.50	36x4½.....	10.00	1.75
32x3½.....	7.00	1.25	34x4.....	9.00	1.50	35x5.....	11.00	2.00
31x4.....	8.00	1.50	34x4½.....	10.00	1.75	37x5.....	12.00	2.00

Do not delay your order! Send it at once with 10% deposit, balance C. O. D., subject to examination. We are Jobbers in all standard makes of Guaranteed Tires. Write for prices—we can save you money.

ACORN TIRE AND REPAIR COMPANY

1547 S. Michigan Avenue

Phones—Calumet 5614-15

CHICAGO, ILLINOIS

SLIGHTLY USED AND DEMONSTRATING TIRES

Our TIRES and TUBES

Mean ECONOMY to Motorists—A Trial Will Convince You

Size	Tires	Tubes	Size	Tires	Tubes	Size	Tires	Tubes
30x3.....	\$4.00	\$1.35	32x4.....	\$7.00	\$1.60	35x4½.....	\$7.90	\$1.80
30x3½.....	4.75	1.45	33x4.....	7.75	1.70	36x4½.....	8.00	1.85
31x3½.....	5.00	1.56	34x4.....	7.75	1.70	37x4½.....	9.25	1.90
32x3½.....	5.25	1.50	35x4.....	7.25	1.75	35x5.....	8.00	2.00
34x3½.....	5.50	1.60	36x4.....	7.50	1.75	36x5.....	9.10	2.00
31x4.....	6.25	1.65	34x4½.....	7.90	1.75	37x5.....	9.50	2.20

Send \$1 deposit with each tire ordered. Tires will be sent promptly C. O. D., with privilege of examination. Specify style of rim to avoid delay.

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30x3½.....	8.50	33x4.....	12.50	34x4½.....	17.00	35x5.....	19.00
32x3½.....	10.00	34x4.....	13.00	35x4½.....	17.50	36x5.....	19.50
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28x3.....	\$ 7.00	\$2.00	32x4.....	\$14.00	\$3.35	35x4½.....	\$21.45	\$4.20
30x3.....	7.00	2.00	33x4.....	14.50	3.50	36x4½.....	22.00	4.30
30x3½.....	8.75	2.30	34x4.....	15.00	3.65	37x4½.....	22.80	4.60
32x3½.....	10.50	2.45	35x4.....	15.85	3.75	35x5.....	23.10	4.65
34x3½.....	11.50	2.70	36x4.....	16.20	3.85	36x5.....	23.95	4.75
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31x4.....	6.75	2.80	6.95
32x4.....	7.00	2.90	7.15
33x4.....	7.50	3.35	7.80
34x4.....	7.75	3.50	8.00
34x4½.....	7.90	3.80	9.65
35x4½.....	8.50	4.00	10.15
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Manufacturers of Screw Machine Products. General Contract Work, Tools, Jigs & Dies. Grinding and Stamping. We can give you prompt deliveries and right prices. Send blue prints.

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We have a completely equipped plant for manufacturing parts of all kinds. Mail blue prints for quotations.

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Brass, Bronze and Aluminum CASTINGS

Pattern Work :: Machine Work
Special Attention Given to Automobile Work

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Full information gladly given.
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FIFTEEN Manufacturers have indicated to our **CONTRACT WORK DEPARTMENT** that they could use to advantage information as to where they could place the following lines of surplus manufacturing work:

Castings (steel, brass, bronze or aluminum)
Dies
Tool
Metal Stampings
Punch Press Work
Screw Machine Work

Machine Parts
Gear Cutting
Grinding
Cam Cutting
Bar and Clutch Work
Forgings
Drop Forgings

Lathe and Milling Machine Work
Patterns (wood & metal)
Plating
Automobile Stampings and other lines.

In this connection you can consult with profit our **Contract Work Department**, page 120 in this week's issue.

DOVER CADILLAC OIL FUNNEL

Fitted with
Brass Strainers

HEAVILY COPPER PLATED

No. 44. 1-quart, 6½-inch diam. top x 7¼ inches high 1 inch \$0.50
This funnel is to fill the oil can in the new Cadillac Eight, and is a great convenience. Every Cadillac owner has been looking for just this funnel.



DOVER SAVAL Combination Measure and Funnel With Automatic Shut-Off Attachment

PATENTED OCT. 22, 1912



Positively prevents overflowing the Oil Tank and spilling oil over the engine and other parts

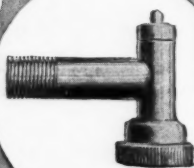
A most practical measure, combined with a funnel for convenience in pouring, but has in the spout a brass ball (ground oil tight) to shut off the flow of the oil instantly (in a very simple manner) at the convenience of the user.

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Perhaps you have been neglecting the all-important matter of tire-pumping and air-testing because of the exertion it involved; the time it took, and the annoyance it caused.

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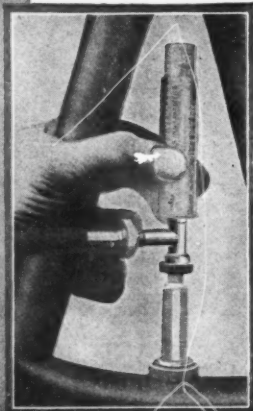
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GURNEY BALL BEARINGS



Gurney Ball Bearings carry heavier loads than other ball bearings because our method of assembling permits filling the races full of balls without cutting a filling slot in the shoulder of the race.

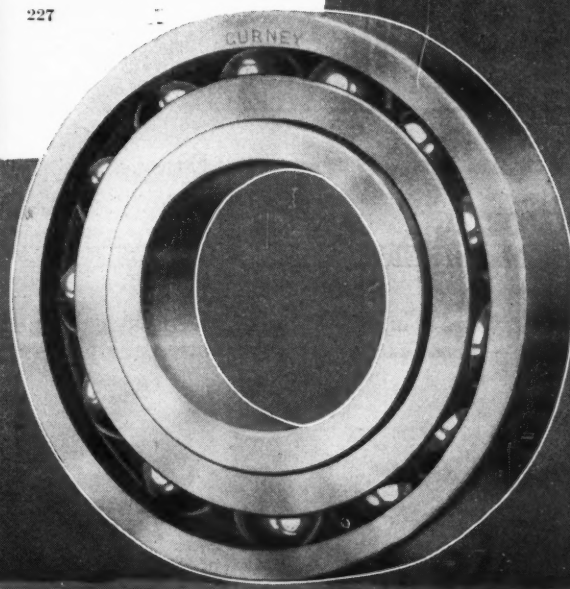
Another reason for the large capacity of Gurney Ball Bearings is the high accuracy of race contour made possible by the use of special machinery developed by our Mr. Gurney.

Our experience in ball bearing engineering is at your service.

Write us.

GURNEY BALL BEARING CO.
Conrad Patent Licensee
JAMESTOWN, N. Y.

227



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This warning is published for several good reasons, chief among which is the present high cost of producing a magazine like all of us want MOTOR AGE to be.

You remember how you felt after you had missed an important lesson at school; the same holds true with your regular reading of MOTOR AGE. By failing to renew your subscription before its expiration, you are very apt to miss a number which alone may be worth the year's subscription price to you.

MOTOR AGE is published to educate and keep you advised of motor car development—to increase your motoring pleasures and decrease your upkeep expense.

You wouldn't expect MOTOR AGE to know in advance how many copies will be wanted after an issue is printed. Probably you realize that we, like most publishers, have reached the stage where it is possible to print only as many copies as are ordered in advance. They cost us more than we get for them and, consequently, we can seldom take care of requests received after the publication of any issue.

Take advantage of this reminder, and if your subscription is about to expire, fill in the blank below and attach your dues for another year.

Date191..

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Mallers Bldg., Chicago, Ill.

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MODEL D
For use anywhere and everywhere. Light but powerful. Pulls three plows.

The Biggest
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Ever Offered
To
Automobile
Dealers

A New Field of Profit Awaits You

With automobile production for 1918 uncertain and the market equally in doubt, you must safeguard your business in some other way. That way is offered by the BATES STEEL MULE Three Plow Tractors.

Thousands of farmers will respond to our farm paper advertising. They demand tractors that will fit all their ground conditions, and a reliable CRAWLER type is the only one that does it. You can satisfy them and make a liberal profit if you handle

The Bates Steel Mule

Fully Covered by Patents

This comprises two sturdy, well-built models that give long, hard service day after day.

Model D has a double crawler drive. Roller bearings throughout and all working parts totally encased against dust. It is powerful, flexible, light, and burns kerosene. Pulls three plows anywhere at a speed from $2\frac{1}{4}$ to $3\frac{1}{2}$ miles per hour. Heavy Duty four cylinder valve-in-head motor.

Model C has a single crawler drive and is built so it can cultivate corn and other row crops. Can be driven from the seat of the implement or binder so that one man operates both tractor and implement. Pulls three plows anywhere. Burns Kerosene.

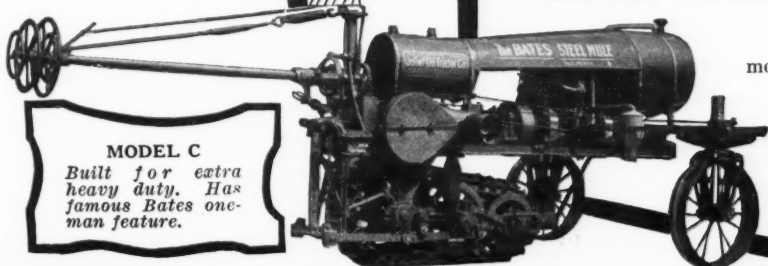
These two models are the product of six years' tractor manufacturing experience and built in one of the largest tractor manufacturing plants in the country. The BATES STEEL MULE, because of its quality of workmanship, is a repeater and the machine the farmer knows he wants.

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Indianapolis, Indiana, U. S. A.

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P. D. Scutto

General Sales Manager



